

**ANNAMALAI UNIVERSITY**  
**BACHELOR OF COMPUTER APPLICATIONS**  
**CBCS PATTERN**

**(With effect from 2021-2022)**

**The Course of Study and the Scheme of Examinations**

S. No.	Part	Study Components		Ins. Hrs / week	Credit	Title of the Paper	Maximum Marks		
		Course Title					CIA	Uni. Exam	Total
<b>SEMESTER I</b>									
1.	I	Language	Paper-1	6	4	Tamil/Other Languages	25	75	100
2.	II	English (CE)	Paper-1	6	4	<b>Communicative English I</b>	25	75	100
3.	III	Core Theory	Paper-1	6	4	Programming in C	25	75	100
4.	III	Core Practical	Practical-1	3	2	Programming in C Lab	25	75	100
5.	III	Allied -1	Paper-1	7	3	Mathematical Foundations - I	25	75	100
<b>6.</b>	<b>III</b>	<b>PE</b>	<b>Paper 1</b>	<b>6</b>	<b>3</b>	<b>Professional English I</b>	<b>25</b>	<b>75</b>	<b>100</b>
7.	IV	Environmental Studies		2	2	Environmental studies	25	75	100
		<b>Sem. Total</b>		<b>36</b>	<b>22</b>		<b>175</b>	<b>525</b>	<b>700</b>
<b>SEMESTER II</b>									
8.	I	Language	Paper-2	6	4	Tamil/Other Languages	25	75	100
9.	II	English (CE)	Paper-2	6	4	<b>Communicative English II</b>	25	75	100
10.	III	Core Theory	Paper-2	5	4	C++ & Data Structure	25	75	100
11.	III	Core Practical	Practical-2	2	2	C++ and Data Structures Lab	25	75	100
12.	III	Allied-1	Paper-2	7	5	Mathematical Foundations - II	25	75	100
<b>13.</b>	<b>III</b>	<b>PE</b>	<b>Paper 1</b>	<b>6</b>	<b>3</b>	<b>Professional English II</b>	<b>25</b>	<b>75</b>	<b>100</b>
14.	IV	Value Education		2	2	Value Education	25	75	100
15.	IV	Soft Skill		2	1	Soft Skill	25	75	100
		<b>Sem. Total</b>		<b>36</b>	<b>25</b>		<b>200</b>	<b>600</b>	<b>800</b>

<b>SEMESTER III</b>						CIA	Uni. Exam	Total	
16.	III	Core Theory	Paper-3	5	4	Programming in JAVA	25	75	100
17.	III	Core Theory	Paper-4	4	4	E-Commerce	25	75	100
18.	III	Core Theory	Paper-5	5	4	Operations Research	25	75	100

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19.	III	Core Practical	Practical-3	4	3	Programming in JAVA Lab	25	75	100
20.	III	ALLIED-2	Paper-3	7	3	Financial Accounting-I	25	75	100
21.	IV	Skill based Subject I	Paper-1	3	2	Web Technology	25	75	100
22.	IV	Non-Major Elective	Paper-1	2	2	Introduction to Information Technology	25	75	100
		<b>Sem. Total</b>		<b>30</b>	<b>22</b>		<b>175</b>	<b>525</b>	<b>700</b>
<b>SEMESTER IV</b>							<b>CIA</b>	<b>Uni. Exam</b>	<b>Total</b>
23.	III	Core Theory	Paper-6	5	4	Relational Database Management Systems	25	75	100
24.	III	Core Theory	Paper-7	4	4	Enterprise Resource Planning	25	75	100
25.	III	Core Theory	Paper-8	5	4	Wireless Data Communications	25	75	100
26.	III	Core Practical	Practical-4	4	3	RDBMS Lab	25	75	100
27.	III	ALLIED-2	Paper-4	7	5	Financial Accounting-II	25	75	100
28.	IV	Skill based Subject -II	Paper-2	3	2	Internet Of Things	25	75	100
29.	IV	Non-Major Elective	Paper-2	2	2	Internet Technology	25	75	100
		<b>Sem. Total</b>		<b>30</b>	<b>24</b>		<b>175</b>	<b>525</b>	<b>700</b>
<b>SEMESTER V</b>							<b>CIA</b>	<b>Uni. Exam</b>	<b>Total</b>
30.	III	Core Theory	Paper-9	6	4	Mobile Application Development	25	75	100
31.	III	Core Theory	Paper-10	6	4	Operating System	25	75	100
32.	III	Core Theory	Paper –11	4	2	Design and Analysis of Algorithms	25	75	100
33.	III	Core Practical	Practical-5	4	3	Mobile Applications Development-Lab	25	75	100
34.	III	Core Practical	Practical-6	4	3	Operating System-Lab	25	75	100
35.	III	Internal Elective I	Paper-1	3	3	<b>(Choose any one)</b> A. Data Mining B. Information Security C. Software Testing	25	75	100
36.	IV	Skill Based Subject III	Paper– 3	3	2	Software Engineering	25	75	100

## B.C.A. Computer Applications (CBCS)

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		<b>Sem. Total</b>		<b>30</b>	<b>21</b>		<b>175</b>	<b>525</b>	<b>700</b>
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## B.C.A. Computer Applications (CBCS)

SEMESTER VI							CIA	Uni. Exam	Total
37.	III	Core Theory	Paper-12	4	4	Open Source Software	25	75	100
38.	III	Core Theory	Paper-13	4	4	Python programming	25	75	100
39.	III	Core Practical	Practical-7	4	2	Python programming Lab	25	75	100
40.	III	Core Practical	Practical-8	4	2	Open Source Programming - Lab	25	75	100
41.	III	Core Project		5	5	Group/ Individual Project Work	25	75	100
42.	III	Internal Elective II	Paper-2	3	3	<b>(Choose any one)</b> 1. Big Data Analytics 2. Cryptography 3. Digital Image Processing	25	75	100
43.	III	Internal Elective III	Paper-3	3	3	<b>(Choose any one)</b> 1. Artificial Intelligence 2. System Software 3. Mobile Computing	25	75	100
44.	IV	Skill Based Subject IV	Paper-4	3	2	Object Oriented analysis and design	25	75	100
45.	V	Extension Activities		0	1		100	0	100
		<b>Sem. Total</b>		30	<b>26</b>		<b>300</b>	<b>600</b>	<b>900</b>
					<b>140</b>				<b>4500</b>

## B.C.A. Computer Applications (CBCS)

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Part	Subject	Papers	Credit	Total Credits	Marks	Total Marks
Part I	Languages	2	4	8	100	200
Part II	Communicative English & English	2	4	8	100	200
Part III	Allied (Odd Semester)	2	3	6	100	200
	Allied (Even Semester)	2	5	10	100	200
	Electives	3	3	9	100	300
	Core	13	(3-5)	50	100	1300
	Core practical	8	(2-3)	20	100	800
	Professional English	2	3	6	100	200
	Compulsory Project (Group/Individual Project)	1	5	5	100	100
Part IV	Environmental Science	1	2	2	100	100
	Soft skill	1	1	1	100	100
	Value Education	1	2	2	100	100
	Lang. & Others /NME	2	2	4	100	200
	Skill Based	4	2	8	100	400
Part V	Extension Activities	1	1	1	100	100
	<b>Total</b>	<b>45</b>		<b>140</b>		<b>4500</b>

**ANNAMALAI UNIVERSITY  
BACHELOR OF COMPUTER APPLICATIONS**

**SYLLABUS  
UNDER CBCS  
(With effect from 2021-2022)**

**SEMESTER I**

**CORE THEORY PAPER -1  
PROGRAMMING IN C**

**OBJECTIVES:**

1. To understand simple algorithms,
2. To understand language constructs
3. To understand and develop programming skills in C.
4. To understand the basic concepts of decision making and looping statements.
5. To understand the concepts of arrays , structures, union, pointers and files.

**UNIT – I**

**Overview of C:** History – Importance – Sample Programs – Basic Structure – Programming Style – Executing – Unix System – MS-DOS System - **Constants, Variables, and Data Types:** Character Set – C Token – Keyword and Identifiers – Constants – Variables – Data Types – Declaration of Storage Class – Assigning Values to Variables – Defining Symbolic Constants – Declaration – Overflow and Underflow of Data - **Operators and Expressions:** Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional, Bitwise, Special Operators – Arithmetic Expressions, Evaluation of Expressions – Precedence of Arithmetic Operators – Some Computational Problems – Type Conversions in Expressions – Operator Precedence and Associativity – Mathematical Functions .

**UNIT – II**

**Managing Input and Output Operations:** Reading, Writing a Character – Formatted Input, Output - **Decision Making and Branching:** Decision Making with If statement – Simple If Statement – The If...Else Statement – Nesting of If...Else Statements – The Else If Ladder – The Switch Statement- The ?: Operator – The Goto Statement - **Decision Making and Looping:** The while Statement – The do Statement – The for Statement – Jumps in Loops – Concise Test Expressions.

**UNIT – III**

**Arrays:** One-Dimensional Arrays - Declaration, Initialization of One-Dimensional Arrays – Two-Dimensional Arrays - Initializing Two-Dimensional Arrays – Multi-Dimensional Arrays – Dynamic Arrays - **Character Arrays and Strings:** Declaring and Initializing String

Variables – Reading Strings from Terminal – Writing Strings to Screen – Arithmetic Operations on Characters – Putting String Together – Comparison of Two Strings –String-Handling Functions – Table of Strings – Other Features of Strings - **User Defined Functions:** Need for User-Defined Functions – A Multi-Function Program – Elements of User-Defined Functions – Definition of Functions – Return Values and Their Types – Function Calls – Function Declaration – Category of Functions – No Arguments and No Return Values – Arguments but no return values – Arguments with Return Values – No Arguments but Returns a value – Functions that Return Multiple Values – Nesting of Functions – Recursion – Passing Arrays, Strings to Functions – The Scope, Visibility and Lifetime of Variables – Multi file Programs.

### **UNIT – IV**

**Structure and Unions:** Defining a Structure – Declaring Structure Variables – Accessing Structure Members – Structure Initialization and Copying and Comparing Structure Variable – Operations on Individual Members – Arrays of Structures – Arrays within Structures – Structures within Structures – Structures and Functions – Unions – Size of Structures – Bit Fields **Pointers:** Understanding Pointers – Accessing the Address of Variable – Declaring, Initialization of Pointer Variables – Accessing a Variable through its pointer – Chain of Pointers – Pointer Expression – Pointer Increments and Scale Factor – Pointers and Arrays – Pointers and Character Strings – Array of Pointers – Pointers as Function Arguments – Functions Returning Pointers – Pointers to Functions – Pointers and Structures – Troubles with Pointers **File Management in C:** Defining and Opening a File – Closing a File – Input/Output Operations on File – Error Handling During I/O Operations – Random Access to Files – Command Line Arguments.

### **UNIT – V**

**Fundamental Algorithms:** Exchanging the values of Two Variables- Counting- Summation of a Set of Numbers-Factorial Computation -Sine Function Computation –Generation of the Fibonacci Sequence-Reversing the Digits of an Integer- Base Conversion – Character to Number Conversion - **Factoring Methods:** Finding the square Root of a Number –The Smallest Divisor of an Integer-The Greatest Common Divisor of the two integers-Generating Prime Numbers- Computing the Prime Factors of an integer –Generation of Pseudo-random Numbers-Raising a Number to a Large Power-Computing the nth Fibonacci Number (Chapters: 2 & 3)

#### **TEXT BOOK:**

1. Programming in ANSI C, E. Balagurusamy, Tata McGrawhill Education, 6th Edition, 2013. ( Unit I to IV )
2. How to Solve it by Computer, R.G.Dromey, PHI International ( Unit V )

#### **REFERENCE BOOKS:**

1. The C Programming Language (ANSI C), Kernighan, B.W. and Ritchie, D.M., PHI.
2. C by Discovery , Foster & Foster , Penram International Publishers, Mumbai.

#### **E - REFERENCES**

1. NPTEL, Introduction to C Programming, Prof.SatyadevNandakumar ,IIT, Computer Science and Engineering Kanpur.

2. NPTEL, Introduction to Problem Solving & Programming, by Prof. Deepak Gupta  
Department of Computer Science and Engineering IIT Kanpur.

**Course Outcomes:**

- The Student will be able to understand the concepts of Constants, Variables, and Data Types, Operators and Expressions
- The Student will be able to understand the concepts of Managing Input and Output Operations, Decision Making and Branching, Decision Making and Looping.
- The Student will be able to understand the concepts of Arrays, Character Arrays and Strings, User Defined Functions.
- The Student will be able to understand the concepts of Structure and Unions, Pointers, File Management in C.
- The Student will be able to understand the concepts of Fundamental Algorithms, Factoring Methods.

**CORE PRACTICAL-1**  
**Programming in C – Lab**

**Objectives:**

1. To understand concepts of for/while loop and switch.
2. To understand language Functions and recursions.
3. To understand and develop String Manipulations.
4. To understand the basic concepts of searching and sorting.
5. To understand the concepts of structures.

**Outcomes:**

**CO1** - Enhance the analyzing and problem solving skills and use the same for writing programs in C.

**CO2** - Write diversified solutions, draw flowcharts and develop a well-documented and indented program according to coding standards.

**CO3** - Learn to debug a given program and execute the C program.

**CO4** - To have enough practice the use of conditional and looping statements.

**CO5** - To implement arrays, functions and pointers.

**Control Statements:**

1. Print n Fibonacci numbers – ( using for )
2. Print n Prime numbers – ( using while )
3. Simple arithmetic on two numbers – ( using switch/case )

**Functions:**

4. Swap two values using call by value / call by reference.

**Recursion:**

5. To compute NcR and NpR
6. To Compute GCD and LCM

**String Manipulation.**

7. Operations on string such as length, concatenation, reverse, counting, and copy of a string to another.

**Matrices:**

8. Matrix Addition, Subtraction, Multiplication, Transpose of n x m matrices.
9. Inverse of a square matrix.

**Searching:**

10. Binary Search.

**Sorting:**

11. Bubble Sort

12. Insertion Sort

**Structures:**

13. Students Mark statement

**Pointers:**

14. Arithmetic operations on pointers.

**Files**

15. Creating/ Reading/ Writing a text/binary file.

**REFERENCE BOOK:**

1. Programming in ANSI C, E. Balagurusamy, Tata McGrawhill Education, 6th Edition, 2013.

**ALLIED 1**

**PAPER - I**

**MATHEMATICAL FOUNDATIONS - I**

**Objectives**

To know about Logical operators, validity of arguments, set theory and set operations, relations and functions, Binary operations, Binary algebra, Permutations & Combinations, Differentiation, Straight lines, pair of straight lines, Circles, Parabola, Ellipse, Hyperbola.

**UNIT-I: SYMBOLIC LOGIC**

Proposition, Logical operators, conjunction, disjunction, negation, conditional and bi-conditional operators, converse, Inverse, Contra Positive, logically equivalent, tautology and contradiction. Arguments and validity of arguments.

**UNIT-II: SET THEORY**

Sets, set operations, venndiagram, Properties of sets, number of elements in a set, Cartesian product, relations & functions,

Relations : Equivalence relation. Equivalence class, Partially and Totally Ordered sets,

Functions: Types of Functions, Composition of Functions.

**UNIT-III: BINARY OPERATIONS**

Types of Binary Operations: Commutative, Associative, Distributive and identity, Boolean algebra: simple properties. Permutations and Combinations.

**UNIT-IV: DIFFERENTIATION**

Simple problems using standard limits,

$$\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}, \lim_{x \rightarrow 0} \frac{\sin x}{x}, \lim_{x \rightarrow 0} \frac{\tan x}{x}, \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n, \lim_{n \rightarrow 0} \frac{e^x - 1}{x}$$

Differentiation, successive differentiation, Leibnitz theorem, partial differentiation, Applications of differentiation, Tangent and normal, angle between two curves.

**UNIT-V: TWO DIMENSIONAL ANALYTICAL GEOMETRY**

Straight Lines - Pair Straight Lines

**Text Book.**

P.R. Vittal, Mathematical Foundations – Maragham Publication,  
Chennai.

**Reference Books**

1. U. Rizwan, Mathematical Foundation - SciTech, Chennai
2. V.Sundaram& Others, Dircrete Mathematical Foundation - A.P.Publication, sirkali.
3. P.Duraipandian& Others, Analytical Geometry 2 Dimension - Emerald publication 1992 Reprint.
4. Manicavachagompillay&Natarajan. Analytical Geometry part I - Two Dimension - S.Viswanathan (printers & publication) Put Ltd., 1991.

**SEMESTER II**

**CORE THEORY PAPER -2**

**C++ & DATA STRUCTURES**

**Objectives:**

1. To understand the concepts of object-oriented programming and master OOP using C++.
2. To understand the concepts of Inheritance, polymorphism and templates.
3. To understand the concepts of different view of data, stack and queues.
4. To understand the concepts of Programming with Recursion, Binary Search Tree and graphs.
5. To understand the concepts of Sorting and Searching Algorithms.

**UNIT-I :**

Principles of Object Oriented Programming – Beginning with C++ – Token , Expressions and Control Structures- Functions in C++ – Classes and Objects – Constructors and Destructors.

**UNIT-II :**

Operator Overloading and Type Conversions – Inheritance : Extending Classes – Pointers, Virtual Functions and Polymorphism - Managing Console I/O Operations. Working with Files - Templates – Exception Handling – Manipulating Strings.

**UNIT-III:**

**Data Design & implementations:** Different views of data – Abstraction and Built-in Types – Arrays  
ADTs Stacks and Queue (Linear and Linked) , Stack (Array and Pointer)- Applications- Infix to Postfix Conversions – Queue(Array and Pointer) – List(Array and Pointer) – Applications: (Polynomial Addition) - Doubly Linked Lists.

**UNIT – IV:**

**Programming with Recursion :** Recursion – Verifying and Writing Recursive Functions –  
**Binary Search Tree :** Implementation – Tree Traversal – **Graphs:** Implementations – BFS – DFS – Dijkstras Shortest Path Algorithm.(Chapter 7:Section 7.1,7.4 7.5, Chapter 8:Section 8.1,8.4, Chapter 9:Section 9.3)

**UNIT-V:**

**Sorting and Searching Algorithms:** Sorting – Searching – Hashing (Chapter 10: Section 10.1,10.2,10.3)

### **TEXT BOOK:**

1. Object Oriented Programming with C++, E Balagurusamy , Tata McGraw Hill, 6<sup>th</sup> Edition, 2014.  
(Units I, II)
2. C++ Plus Data Structure, Nell Dale, Jones & Bartlett Publishers , 4<sup>th</sup> Edition, 2010. (Units III, VI & V)

### **REFERENCES:**

1. C++ The Complete Reference, Herbert Schildt, Tata McGraw Hill, 4<sup>th</sup> Edition, 2003.
2. OOP In ANSI C and Turbo C, Ashok N.Kamthene, Pearson Education, 6<sup>th</sup> Edition, 2008.
3. Data Structures and Algorithms, Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, Addison Wesley Longman Inc., 2<sup>nd</sup> Edition, 1999.

### **Course Outcomes:**

- The Student will be able to understand the concepts of object oriented programming Apply structure and inline functions.
- The Student will be able to understand the concepts of the types of inheritances and Applying various levels of Inheritance for real time problems Apply the OOPs concepts class and object. Understand Explain the file concept and exception handlings in C++
- The Student will be able to understand the concepts of Stacks and Queue using array and pointers.
- The Student will be able to understand the concepts of Recursion, Binary Search Tree and graphs.
- The Student will be able to understand the concepts of Sorting and Searching Algorithms.

## CORE PRACTICAL -2 C++ & DATA STRUCTURES LAB

### Objectives:

1. To develop C++ programming skills in design
2. To understand the basic concepts of different abstract types and structure of data.
3. To understand the concepts of Function Overloading
4. To understand the concepts of Stack, Queue, List, Doubly Linked List - using Pointers- using Arrays.
5. To understand the concepts of Searching and Sorting Algorithms.

### LIST OF LAB EXERCISES

1. Constructors & Destructors, Copy Constructor.
2. Friend Function & Friend Class.
3. Inheritance.
4. Polymorphism & Function Overloading.
5. Virtual Functions.
6. Overload Unary & Binary Operators Both as Member Function & Non Member Function.
7. Class Templates & Function Templates.
8. Exception Handling Mechanism.
9. Standard Template Library concept.
10. File Stream classes.
11. Array implementation of Stack, Queue : Infix to postfix
12. Implementation of Stack, Queue, List, Doubly Linked List - using Pointers- Polynomial Addition
13. Implementation of Binary Search Tree, Traversal
14. Implementation of Searching and Sorting Algorithms.
15. Graph Implementation of shortest path (Djikstras)

### REFERENCE :

1. Object Oriented Programming with C++, E Balagurusamy , Tata McGraw Hill, 6th Edition, 2014.
2. C++ Plus Data Structure, Nell Dale, Jones & Bartlett Publishers , 4th Edition, 2010.

### Course Outcomes:

- Understand the Creating and Deleting the Objects with the Concepts of Constructors and Destructors.
- Demonstrate the Polymorphism Concepts and Operator Overloading.
- Understand basic Data Structures such as Arrays, Linked Lists, Stacks, Queues, Doubly Linked List and Infix to Postfix Conversion.
- Apply Algorithm for solving problems like Sorting and Searching.
- Apply Algorithms and use Graphs and Trees as tools to visualize and simplify Problems

**ALLIED – 1  
PAPER – 2  
MATHEMATICAL FOUNDATIONS II**

**Objectives**

To know about Matrix Operations, Symmetric, Skew-Symmetric, Hermitian, Skew-Hermitian, Orthogonal, Unitary Matrices. Rank of a Matrix Solutions of linear equations Consistency and Inconsistency, Characteristic roots and Characteristics Vectors, Cayley - Hamilton Theorem, Integration of rational functions, Integration by parts, Reduction formulae, Area and volume using integration, Planes, Straight lines, Spheres, Curves, Cylinders.

**UNIT-I: MATRICES**

Multiplication of matrices, Singular and Non-Singular matrices, Adjoint of a Matrix, Inverse of a matrix Symmetric and Skew-Symmetric, Hermitian and Skew-Hermitian, Orthogonal and unitary matrices, Rank of a matrix, Solution of Simultaneous Linear equations by

- (i) Cramer's rule.
- (ii) Matrix Inversion Method.

**UNIT-II: MATRICES**

Test for Consistency and Inconsistency of linear equations, (Rank Method), characteristic roots and characteristic vectors, Cayley - Hamilton theorem, matrix of linear transformations: reflection about the x, y axes and the line y=x, rotation about the origin through an angle, expansion or compression, shears, translation.

**UNIT-III**

Integration Simple problems, integration of rational function involving algebraic expressions of the form

$$\frac{1}{ax^2+bx+c}, \frac{1}{\sqrt{ax^2+bx+c}}, \frac{px+q}{ax^2+bx+c}, \frac{px+q}{\sqrt{ax^2+bx+c}}$$

integrations using simple substitutions integrations involving trigonometric functions of the form

$$\frac{1}{a+b\cos x}, \frac{1}{a^2\sin^2x+b^2\cos^2x}$$

Integration by parts.

**UNIT-IV**

Properties of definite integrals. Reduction formulae for

$\int x^n e^{ax} dx$ ,  $\int \sin^n x dx$ ,  $\int \cos^n x dx$ ,  $\int x^m (1-x)^n dx$ , applications of integration for (i) Area under plane curves, (ii) Volume of solid of revolution.

**UNIT-V: ANALYTICAL GEOMETRY OF THREE DIMENSION**

Planes, straight lines.

**Text Book.**

P.R.Vittal, Mathematical Foundations - Margham Publication, Chennai.

**Reference Books**

1. U. Rizwan, Mathematical Foundation - SciTech, Chennai
2. V.Sundaram & Others, Discrete Mathematical Foundation - A.P.Publication, Sirkali.
3. P.Duraipandian & Others, Analytical Geometry 3 Dimension – Emerald publication 1992 Reprint.
4. Manicavachagompillay & Natarajan. Analytical Geometry part II - three Dimension - S.Viswanathan (printers & publication) Put Ltd., 1991.

## **III SEMESTER**

### **CORE PAPER-3**

#### **PROGRAMMING IN JAVA**

##### **COURSE OBJECTIVES:**

- Knowing about a General-purpose and Purely object-oriented programming language including data types, control statements, and classes
- Secured, well-suited for internet programming using applets and GUI-based

##### **UNIT I**

Declarations and Access Control: Identifiers and Keywords: Oracle's Java Code Conventions. Define Classes: Import Statements and the Java API - Static Import Statements. Use Interfaces: Declaring an Interface- Declaring Interface Constants. Declare Class Members: Access Modifiers - Non access Member Modifiers - Constructor Declarations - Variable Declarations. Declare and Use enums: Declaring enums. Object Orientation: Encapsulation - Inheritance and Polymorphism- Polymorphism - Overriding / Overloading: Overridden Methods -Overloaded Methods.

##### **UNIT II**

Object Orientation: Casting - Implementing an Interface - Legal Return Types: Return Type Declarations - Returning a Value. Constructors and Instantiation: Overloaded Constructors - Initialization Blocks. Statics: Static Variables and Methods. Assignments: Stack and Heap - Literals, Assignments, and Variables: Literal Values for All Primitive Types. Scope - Variable Initialization - Passing Variables into Methods: Passing Object Reference Variables - Passing Primitive Variables. Garbage Collection. Operators: Java Operators - Assignment Operators - Relational Operators - instanceof Comparison - Arithmetic Operators - Conditional Operator - Logical Operators.

##### **UNIT III**

Working with Strings, Arrays, and Array Lists: Using String and StringBuilder: The String Class - The StringBuilder Class - Important Methods in the StringBuilder Class. Using Arrays: Declaring an Array -Constructing an Array - Initializing an Array. Using ArrayList:ArrayList Methods in Action - Important Methods in the ArrayList Class. Flow Control and Exceptions: Using if and switch Statements -Creating Loops Constructs - Handling Exceptions - Catching an Exception Using try and catch - Using finally. String Processing, Data Formatting Resource Bundles: String, StringBuilder, and StringBuffer -Dates, Numbers, Currencies, and Locales.

##### **UNIT IV**

I/O and NIO: File Navigation and I/O: Creating Files Using the File Class - Using FileWriter and FileReader. File and Directory Attributes -DirectoryStream - Serialization. Generics and Collections: toString(), hashCode(), and equals(): The toString() Method - Generic Types -Generic Methods - Generic Declarations. Inner

## **B.C.A. Computer Applications (CBCS)**

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Classes: Method – Local. Inner Classes - Static Nested Classes - Threads: Defining, Instantiating, and Starting Threads - Thread States and Transitions - Synchronizing Code, Thread Problems - Thread Interaction. Concurrency: Concurrency with the java.util.concurrent Package - Apply Atomic Variables and Locks - Use java.util.concurrent Collections - Use Executors and ThreadPools.

### **UNIT V**

Applets: Applet fundamentals - Applet class - Applet life cycle - Steps for developing an applet program - Passing values through parameters - Graphics in an applet - Event-handling. GUI Applications - Part 1: Graphical user interface - Creating windows - Dialog boxes - Layout managers - AWT component classes - Swing component classes. GUI Applications - Part 2: Event handling - Other AWT components - AWT graphics classes - Other swing controls.

### **TEXT BOOK(S):**

1. Kathy Sierra, Bert Bates — OCA/OCJP Java SE 7 Programmer I & II Study Guide, Oracle Press. (Unit I,II,III,IV).
2. Sagayaraj, Denis, Karthik and Gajalakshmi, 2018, Java Programming - For Core and Advanced Learners, University Press (India) Private Limited, Hyderabad.(Unit V).

### **REFERENCE BOOKS:**

1. Hebert Schild, 2002, The Complete Reference Java2, [Fifth Edition]. Tata McGraw-Hill, New Delhi.
2. John Hubbard, R.2004. Programming with Java. [Second Edition]. Tata McGraw-Hill, New Delhi.
3. Debasish Jana. 2005. Java and Object-Oriented Programming Paradigm, [Second Printing]. Prentice-Hall of India, New Delhi.
4. Sagayaraj, Denis, Karthik and Gajalakshmi 2018, Java Programming for core and advanced Learners, University Press India Pvt. Ltd., Hyderabad.

### **Course Outcomes:**

- Students are able to know about a General-purpose and Purely object-oriented programming language including data types, control statements, and classes
- Students are able to Secured, well-suited for internet programming using applets and GUI-based

**CORE PAPER-4**

**E-COMMERCE**

**Objectives:**

- ✓ To provide the knowledge about commerce through electronic medium & information system.
- ✓ To understand the concepts of security.
- ✓ To understand the basic knowledge of E- Payments.
- ✓ To understand the concepts of EDI.
- ✓ To understand the concepts of Trading relationships.

**UNIT I**

**15**

**Hours**

Electronic Commerce Framework, Traditional Vs. Electronic Business Application, The Anatomy of E-Commerce Applications. Network infrastructure for E-Commerce – Components of the I-way – Global Information Distribution Networks – Public policy issues shaping the I – way. Network Access Equipment

**UNIT II**

**15**

**Hours**

The internet as a Network Infrastructure, Network Security and Firewalls – Client Server Network Security – Firewalls and Network Security – Data and Message Security – Encrypted Documents and Electronic Mail.

**UNIT III**

**15**

**Hours**

Electronic Commerce and World Wide Web, Consumer Oriented E-Commerce, Electronic Payment Systems

**UNIT IV**

**15**

**Hours**

Electronic Data Interchange (EDI), EDI application in business, EDI and E-commerce – EDI implementation. Intra-organizational Electronic Commerce - Supply Chain Management.

### UNIT V

15

#### Hours

Corporate Digital Library – Advertising and marketing on the Internet – E-Commerce Catalogs or Directories- On demand Education and Digital Copyright – Applets, Browsers & Software Agents.

#### TEXTBOOK:

1. Frontiers of Electronic Commerce, R. Kalakota and Andrew. B. Whinston, Pearson , 11th Edition , 2011.

#### REFERENCES:

1. Understanding Electronic Commerce, DaidKosiur, Microsoft Press, 1997.
2. From EDI to Electronic Commerce, Soka, McGraw Hill, 1995.
3. Electronic Commerce Management, Saily Chan, John Wiley, 1998.

#### Course Outcomes:

- The Student will be able to understand the concepts of E-commerce and its different types and describe the network infrastructure for E-commerce.
- The Student will be able to understand the concepts of networks and fundamental of security concepts, security services to counter them, understand the fundamental properties of cryptography Techniques.
- The Student will be able to understand the concepts of electronic payment systems, online security and understand the fundamentals of create a E-commerce web site.
- The Student will be able to understand the concepts of the basic fundamentals of electronic document interchange EDI, supply chain management process.
- The Student will be able to understand the concepts of internet trading relationships including inter organization and intra-organizations.

**CORE PAPER-5**  
**OPERATION RESEARCH**

**Objectives:**

- ✓ To understand the concepts of Linear Programming.
- ✓ To understand the concepts of Transportation, Assignment problem.
- ✓ To understand the concepts of sequence problem.
- ✓ To understand the concepts of PERT and CPM.
- ✓ To understand the concepts of Cost Flow Problem.

**UNIT- I: 9 Hours**

**LINEAR MODELS:** Basics of OR & Decision making - Role of computers in OR, Linear Programming Problem – Formulation, Graphical solution of two variables Canonical & standard form of LPP, Simplex method, Charne’s method of penalties.

**UNIT- II: 9 Hours**

**TRANSPORTATION AND ASSIGNMENT PROBLEMS:** Transportation algorithm - Degeneracy algorithm- Unbalanced Transportation problem Unbalanced assignment algorithm.

**UNIT – III: 9 Hours**

**SEQUENCING PROBLEM:** Processing of n jobs through two machines - Processing of n jobs through three machines- Processing of n jobs through m machines.

**UNIT- IV: 9 Hours**

**PERT & CPM:** Network - Fulkerson’s rule- Measure of activity- PERT computation- CPM computation.

**UNIT –V:**

**9**

**Hours**

**NETWORK MODELS:** Network definition- Minimal spanning tree problem- Shortest route problem- Maximal flow problem- Minimal cost capacitated flow problem.

**TEXT BOOK**

1. Hamdy A. Taha, Operations Research An Introduction, Eighth Edition, Pearson Education, Inc., 2008
2. Kantiswaroop, Gupta P.K and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi, 2008

**REFERENCES**

1. Prem Kumar Gupta and D.S. Hira, Operations Research, S. Chand and Co., Ltd. New Delhi, 2008.
2. Gupta R. K., Linear Programming, Krishna Prakashan Media (P) Ltd. , 2009.

**E - REFERENCES**

1. Lecture Series on Fundamentals of Operations Research by Prof. G. Srinivasan, Department of Management Studies, IIT Madras. For more details on NPTEL visit <http://nptel.iitm.ac.in>

**Course Outcomes:**

- The Student will be able to understand the concepts of optimization and to formulate and Solve Linear Programming problems.
- The Student will be able to understand the concepts of Transportation problem and Assignment problem.
- The Student will be able to understand the concepts of sequencing problem.
- The Student will be able to understand the concepts of PERT-CPM and their applications in product planning control.
- The Student will be able to understand the concepts of Solve the Minimal Spanning Tree Problem, Shortest Route Problem, Maximal Flow Problem and Minimal Cost Capacitated Flow Problem.

**CORE PRACTICAL - Practical-3**

**PROGRAMMING IN JAVA LAB**

**List of Practical's**

1. Implementation of Classes and Objects
2. Implementation of Inheritance and Polymorphism
3. Implementation of Interface and Package concepts
4. Implementation of Flow, Border ,Grid Layouts
5. Implementation of Tic-Tac Toe Application Using Applets
6. Implementation of Frames, Menus, Dialog
7. Implementation of Swing concepts
8. Implementation of Exception Handling
9. Implementation of Multi Threading
10. Implementation of I/O Streams
11. Implementation of Java Networking concepts
12. Implementation of Java Servlets ( Connecting Database)
13. Implementation of RMI
14. Implementation of Java Beans

**ALLIED - 2**

**PAPER - 3**

**FINANCIAL ACCOUNTING– I**

**COURSE OBJECTIVES:**

- The objective of this paper is to help the students to acquire conceptual knowledge of accounting.

**COURSE OUTCOMES:**

On the successful completion of the course, the student will be able

**CO**

**CO STATEMENT**

**NUMBER**

<b>CO1</b>	To introduce the basic concepts and conventions to the students, this would help in development of accounting knowledge.
<b>CO2</b>	To understand the concept of Double entry system this helps in preparation of various books of accounts.
<b>CO3</b>	To develop the capability of students to prepare the Final Accounts of a Small Business Concern.
<b>CO4</b>	To introduce the concept of Single entry system of Accounting which helps them to prepare the accounts from incomplete records.
<b>CO5</b>	To enhance the Accounting Knowledge by introducing the practical uses of Average Due Date and Bank Reconciliation Statement.

**Unit-I**

**INTRODUCTION TO ACCOUNTING**

Meaning- Definition- Functions- Objectives- Users of Accounting Information- Accounting Concepts and Conventions – Advantages and Limitations of Accounting.

**Unit-II**

**DOUBLE ENTRY SYSTEM OF ACCOUNTING**

Meaning and concepts - Golden Accounting Rules- Journal Entries- Ledger- Trail Balance – Rectification of Errors (Simple Problems).

**Unit-III**

**FINAL ACCOUNTS**

Preparation of Trading Account, Profit and Loss Account and Balance Sheet- Adjustment Entries (Simple Problems).

### **Unit-IV**

#### **SINGLE ENTRY SYSTEM**

Meaning - Features - Advantages - Limitations - Methods- Net Worth Method – Conversion Method (Simple Problems).

### **Unit-V**

#### **AVERAGE DUE DATE AND BANK RECONCILIATION STATEMENT**

Average Due Date - Meaning -Uses – Problems - Bank Reconciliation Statement-Meaning- Reasons for Preparation- Procedures and Preparation of Bank Reconciliation statement (Simple Problems).

**DISTRIBUTION OF MARKS: THEORY 20% AND PROBLEMS 80%**

#### **TEXT BOOK**

<b>S.No</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	T.S.Reddy and Murthy	Financial Accounting	Margham Publications	2018

#### **REFERENCE BOOKS**

<b>S.No</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	M.C. Shukla and T.S. Grewal&co	Advanced Accounts	S. Chand & Co	2016
2	R.L. Gupta	Financial Accounting	Sultan chand	2014
3	S.P. Jain &K.L Narang,	Financial Accounting	Kalyani Publication	2017
4	R.S.N Pillai&V.Bagavathi	Fundamental of Advanced Accounting, Volume – I	S. Chand & Co	2013

**SKILL BASED SUBJECT**

**PAPER-1**

**WEB TECHNOLOGY**

**Objective:**

- ✓ This course introduces the concepts of HTML.ASP, VB Script,.
- ✓ This course introduces the concepts of control statements and looping statements in Java script.
- ✓ This course introduces the concepts of Java Script Cookies.
- ✓ This course introduces the concepts of ASP.NET
- ✓ This course introduces the concepts of OLEDB connection.

**Unit I:**

**8**

**Hours**

Introduction to VBScript - Adding VBScript Code to an HTML Page - VB Script Basics - VBScript Data Types - VBScript Variables - VBScript Constants - VBScript Operators – mathematical- comparison-logical - Using Conditional Statements - Looping Through Code - VBScript Procedures – type casting variables - math functions –date functions – string functions –other functions - VBScript Coding Conventions - Dictionary Object in VBScript - Err Object

**Unit-II:**

**8**

**Hours**

Introduction to Javascript – Advantages of Javascript – Javascript syntax - Data type –Variable - Array – Operator & Expression – Looping – control structures - Constructor Function – user defined function Dialog Box .

**Unit III:**

**8**

**Hours**

Javascript document object model – Introduction – Object in HTML – Event Handling – Window object – Document object – Browser object – Form object – Navigator object – Screen object – Build in object – User defined object – Cookies.

**Unit IV:**

**8 Hours**

ASP.NET Language Structure – Page Structure – Page event , Properties & Compiler Directives . HTML server controls – Anchor, Tables, Forms, Files . Basic Web server Controls – Label, Text box, Button, Image Links, Check & radio Button, Hyperlink, Data List Web Server Controls – Check box list. Radio button list, Drop down list, List box, Data grid, Repeater.

### **Unit V:**

**8**

### **Hours**

Request and Response Objects, Cookies, Working with Data – OLEDB connection class, command class, transaction class, data adaptor class, data set class. Advanced issues – email, Application issues, working with IIS and page Directives , error handling. Security – Authentication, IP Address, Secure by SSL & Client Certificates.

### **TEXT BOOKS:**

1. I.Bayross, 2000, Web Enable Commercial Application Development Using HTML, DHTML, Javascript, Perl CGI, BPB Publications.
2. A.Russell Jones, Mastering Active Server Pages 3, BPB Publications.

### **REFERENCE BOOKS:**

1. HathleenKalata, Internet Programming with VBScript and JavaScript, Thomson Learning
2. Mike McGrath, XML Harness the Power of XML in easy steps, Dreamtech Publications
3. T.A. Powell, 2002, Complete Reference HTML , TMH.
4. J.Jaworski, 1999, Mastering Javascript, BPB Publications.
5. Powell, Thomas; Schneider, Fritz, JavaScript: The Complete Reference, 2nd edition 2004, TMH

### **Course Outcomes:**

- The Student will be able to understand the concepts of HTML.
- The Student will be able to understand the concepts of java scripts.
- The Student will be able to understand the concepts of user defined functions.
- The Student will be able to understand the concepts of Active Server Page.

## **B.C.A. Computer Applications (CBCS)**

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- The Student will be able to understand the concepts of – OLEDB connection class.

**NON-MAJOR ELECTIVE**

**PAPER-1**

**Introduction to Information Technology**

**OBJECTIVES:**

The subject aims to build the concepts regarding:

- Major components of Computer System and its working principles.
- Role of an Operating System and basic terminologies of networks.
- How the Information Technology aids for the Current Scenario.
- To understand the Computer Software.
- To understand internet applications

**UNIT-I**

**Introduction:** Characteristics of Computers-Technological Evolution of Computers-The Computer Generations-Categories of Computer. **Data and Information:** Introduction-Types of Data-A Simple Model of a Computer-Data Processing Using a Computer-Desktop Computer. **Acquisition of Number and Textual Data:** Introduction- Input Units-Internal Representation of Numeric Data-Representation of Characters in Computers-Error-Detecting Codes.

**UNIT-II**

**Data Storage:** Introduction-Memory Cell-Physical Devices Used as Memory Cells-Random Access Memory-Read Only Memory- Secondary Memory- Floppy Disk Drive-Compact Disk Read Only Memory (CDROM)-Archival Memory. **Central Processing Unit:** The Structure of a Central Processing Unit-Specification of a CPU-Interconnection of CPU with Memory and I/O Units.

**UNIT-III**

**Computer Networks:** Introduction-Local Area Network (LAN)- Applications of LAN-Wide Area Network (WAN)-The Future of Internet Technology. **Output Devices:** Introduction- Video Display Devices-Flat Panel Displays-Printers.

**UNIT-IV**

**Computer Software:** Introduction-Operating System-Programming Languages-A Classification of Programming Languages. **Data Organization:** Introduction-Organizing a Database-Structure of a Database- Database Management System-Example of Database Design.

**UNIT-V**

**Some Internet Applications:** Introduction- E-mail- Information Browsing Service- The World Wide Web- Information Retrieval from the World WideWeb-Other Facilities Provided by Browsers - Audio on the Internet.**Societal Impactsof Information Technology:** CareersinInformation Technology.

**TEXTBOOKS:**

1. *Rajaraman, V.* 2008. **Introduction to Information Technology.** [Sixth Printing].

PrenticeHall of India Pvt. Limited, New Delhi.(UNIT I toV)

2. *Nagpal, D.P.* 2010. **Computer Fundamentals**. [First Edition, Revised]. S. Chand & Company Ltd, New Delhi. (**UNIT I (Introduction: Characteristics of Computers to Categories of Computer)**)

### **REFERENCE BOOKS:**

1. *ITL Educations Solution Limited.* 2009. **Introduction to Computer Science**. [Fourth Impression]. Pearson Education, New Delhi.
2. *Alexis Leon and Mathews Leon.* 1999. **Fundamentals of Information Technology**. [First Edition]. Leon TECHWorld, New Delhi.

### **COURSE OUT COMES :**

- Students understand Major components of Computer System and its working principles.
- Students learn and understand the Role of an Operating System and basic terminologies of networks.
- Students understand how the Information Technology aids for the Current Scenario.
- Students understand the Computer Software.
- Students understand internet applications

**SEMESTER IV  
CORE PAPER-6**

**RELATIONAL DATABASE MANAGEMENT SYSTEMS**

**Objective:**

- ✓ The students are able to understand database concepts and database management system software and have a high-level understanding of major DBMS components and their function.
- ✓ The students are able to understand the E R model and relational model.
- ✓ The students are able to be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
- ✓ The students are able to Understand Functional Dependency and Functional Decomposition.
- ✓ The students are able to understand the architecture of database management system and also understand the various different architecture such as server system architecture, parallel systems and distributed database systems.

**UNIT- I : DATABASE ARCHITECTURE AND ER DIAGRAM**

**12**

**Hours**

Database system applications - Purpose of database systems - View of data- Database languages - Database architecture - Database users and administrators - History of database systems-Entity relationship modeling: entity types, entity set, attribute and key, relationships, relation types, roles and structural constraints, weak entities, enhanced E-R and object modeling, sub classes; super classes, inheritance, specialization and generalization

**UNIT- II: RELATIONAL DATA MODEL**

**12 Hours**

Relational model concepts, Relational constraints, Relational Languages : Relational Algebra, The Tuple Relational Calculus - The Domain Relational Calculus - SQL: Basic Structure-Set Operations- Aggregate Functions-Null Value- Nested Sub Queries-Views Complex Queries Modification Of Database-Joined Relations-DDL-Embedded SQL-Dynamic SQL-Other SQL Functions- -Integrity and Security.

**UNIT – III: DATA NORMALIZATION 12**

**Hours**

Pitfalls in relational database design – Decomposition – Functional dependencies – Normalization – First normal form – Second normal form – Third normal form – Boyce-codd normal form – Fourth normal form – Fifth normal form

**UNIT- IV: STORAGE AND FILE ORGANIZATION 12**

**Hours**

Disks - RAID -Tertiary storage - Storage Access -File Organization – organization of files - Data Dictionary storage

**UNIT- V: QUERY PROCESSING AND TRANSACTION MANAGEMENT 12**

**Hours**

Query Processing - Transaction Concept - Concurrency Control –Locks based protocol Deadlock Handling -Recovery Systems

**TEXT BOOK:**

1. Abraham Silberschatz, Henry Korth, S.Sudarshan, Database Systems Concepts, Sixth Edition, McGraw Hill, 2010.
2. Raghu Ramakrishnan and Johannes Gehrke, Database management systems, Third Edition, 2002

**REFERENCES**

1. Bipin Desai, An Introduction to database systems, Galgotia Publications, 2010.
2. RamezElamassri, Shankant B-Navathe, Fundamentals of Database Systems, Pearson, 7th Edition, 2015

**E - REFERENCES**

1. NPTEL, Introduction to database design, Dr P Sreenivasa Kumar Professor CS&E, Department, IIT, Madras
2. NPTEL, Indexing and Searching Techniques in Databases Dr. Arnab Bhattacharya, IIT Kanpur

**Course Outcomes:**

- Describe the database architecture and its applications Sketch the ER diagram for real world applications Uses various ER diagram for a similar concepts from various sources.
- Discuss about the relational algebra and calculus Construct various queries in SQL and PL/SQL Compiles various queries in SQL, Relational Calculus and Algebra.
- Describe the various normalization forms Apply the normalization concepts for a table of data Practices a table and implement the normalization concepts.
- Explain the storage and accessing of data.
- Illustrate the query processing in database management. Define the concurrency control and deadlock concept

**CORE PAPER - 7**

**ENTERPRISE RESOURCE PLANNING**

**Objective:**

- ✓ With the basic concepts of ERP systems the students are able to understand the business process, business function and differences between business process and business functions. They also came to know the key differences between raw data and raw materials.
- ✓ The students are able to understand the exchange of information between AF, SCM, HR and MS. And they also learn about CRM, budget and preparing balance sheets.
- ✓ The students are able to understand the key factors related to marketing and sales in the companies, and the differences among ( Material Requirement Planning) MRP, MRP II, and ERP systems.
- ✓ They also understand the inter relationship between the other functional areas like SCM, AF, HR and customer. Concepts and techniques.
- ✓ The students are able to understand the power of human resources such as managing man power, job skills preparing paybills and taking legal actions to the compliances and hiring needs.

**UNIT - I : INTRODUCTION**

**8**

**Hours**

ERP: An Overview, Benefits of ERP, ERP and Related Technologies, Business Process Reengineering (BPR), Data Warehousing, Data Mining, OLAP, SCM

**UNIT- II: ERP IMPLEMENTATION**

**8**

**Hours**

ERP Implementation Lifecycle, Implementation Methodology, Hidden Costs, Organizing the Implementation, Vendors, Consultants and Users, Contract with Vendors.

**UNIT- III: THE BUSINESS MODULES**

**8**

**Hours**

Business modules in an ERP Package, Finance, Manufacturing, Human Resources, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution

### **UNIT- IV: ERP PACKAGES 8**

#### **Hours**

ERP Market Place, SAP AG, PeopleSoft, Baan, JD Edwards, Oracle, QAD, SSA

### **UNIT- V: ERP –PRESENT AND FUTURE 8**

#### **Hours**

Turbo Charge the ERP System, EIA, ERP and e-Commerce, ERP and Internet, Future Directions.

#### **TEXT BOOK:**

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, New Delhi, 2000

#### **REFERENCES**

1. Joseph A Brady, Ellen F Monk, Bret Wagner, “Concepts in Enterprise Resource Planning”, ThompsonCourseTechnology, USA, 2001.
2. Vinod Kumar Garg and Venkatakrishnan N K, “Enterprise Resource Planning – Concepts and Practice”, PHI, New Delhi, 2003

#### **E- REFERENCES**

1. ERP, Prof. P. K. Biswas, Dept. of Electronics and Electrical Communication Engg., IIT, Kharagpur

#### **Course Outcomes:**

- Understanding the functionalities of Enterprise resource planning
- Understanding Characterize the ERP implementation procedures
- Understanding the elements of ERP
- Understanding the available ERP packages
- Understanding the models of ERP with other related technologies

**CORE PAPER - 8**

**WIRELESS DATA COMMUNICATION**

**Objectives:**

- ✓ This course introduces the concepts and theories of networking
- ✓ To apply them to various situations, classifying networks, analyzing performance and implementing new technologies.
- ✓ To implement the various new wireless technologies.
- ✓ To implement the various TCP/IP protocols.
- ✓ To implement the various security threads.

**UNIT-1 BASIC CONCEPTS OF OSI LAYERS**

**9**

**Hours**

Data Communication – Networks – Protocol and Standards – Line Configuration – Topology – Transmission Modes – Categories of Networks – Internetworks- OSI Models – Functions of OSI Layers.

**UNIT-II SIGNALS AND TRANSMISSION MEDIA**

**9**

**Hours**

Analog and digital – Periodic and Non Periodic signals – Analog Signals – Time And Frequency Domain - Composite Signals- Digital signals – Guided Media – UnGuided Media – Transmission Impairment – Performance.

**UNIT-III ERROR DETECTION, CORRECTION AND DATA LINK CONTROL**

**9**

**Hours**

Type of errors –Detection-Vertical Redundancy Check (VRC) -Longitudinal Redundancy Check (LRC) Cyclic Redundancy Check (CRC) – check sum – Error Corrections – Flow Control – Error Control.)**SWITCHING & NETWORK DEVICES:** Circuit Switching-Packet Switching-Message Switching Repeaters – Bridges – Routers – Gateways-other Devices - Routing Algorithms-Distance Vectors Routing- Link State Routing.

**UNIT- IV: WIRELESS NETWORKS**

**9 Hours**

Wireless LAN: Advantages and Disadvantages-Infrared Vs Radio Transmission – Infrastructure Networks- Ad hoc Networks – Bluetooth- Wireless ATM:

Working Group Services- Reference Model – Functions – Radio Access Layer – Handover- Handover reference model- Requirements and Types.

**UNIT-V TCP/IP PROTOCOL SUITE: PART I, PROTOCOLS & NETWORK SECURITY**

**9 Hours**

Overview Of TCP/IP – Network Layer – Addressing – Subnetting – Other Protocols In The Network Layer – Transport Layer – Client/Server Model – Bootstrap Protocol and DHCP - Domain Name System (DNS) – Tel Net –File Transmission Protocol (FTP) – Simple Mail Transfer Protocol (SMTP) – SNMP Protocol – Hyper Text Transmission Protocol (HTTP) – World Wide Web (WWW) –Four Aspects of Security – Privacy – Digital Signature – PGP – Access Authorization.

**Text Book:**

1. Data Communication and Networking 2nd Edition Behrouz A. Forouzan, McGraw Hill Education 2014.
2. Stojmenovic and Cacute, Handbook of Wireless Networks and Mobile Computing, Wiley, 2002, ISBN 0471419028.

**Reference Books:**

1. Data and Communication Network, William Stallings PHI 2014.
2. Computer Networks, Andrew S. Tanenbaum, David J. Wetherall, 5th Edition, Prentice Hall. 2010

**E REFERENCES**

1. <http://nptel.ac.in/video.php?subjectId=117102062>

**Course Outcomes:**

- To understand the concepts of basic OSI layers.
- To understand the concepts of signals and transmission media.
- To understand the basic concepts of error detection and DLC
- To understand the Characterize of wireless transmission technologies
- To understand the concepts of Security.

**Core Practical (Practical-4)**

**RDBMS LAB**

**Objectives:**

- ✓ To understand the concepts of DDL/DML/DCL/TCL commands.
- ✓ To understand the concepts of Join queries.
- ✓ To understand the concepts of exception handling.
- ✓ To understand the concepts of cursors.
- ✓ To understand the concepts of packages.

**LAB EXERCISES:**

1. Execute a single line query and group functions.
2. Execute DDL Commands.
3. Execute DML Commands
4. Execute DCL and TCL Commands.
5. Implement the Nested Queries.
6. Implement Join operations in SQL
7. Create views for a particular table
8. Implement Locks for a particular table.
9. Write PL/SQL procedure for an application using exception handling.
10. Write PL/SQL procedure for an application using cursors.
11. Write a PL/SQL procedure for an application using functions
12. Write a PL/SQL procedure for an application using package

**REFERENCE BOOK:**

1. Abraham Silberschatz, Henry Korth, S.Sudarshan, Database Systems Concepts, Sixth Edition, McGraw Hill, 2010.
2. Raghuram Ramakrishnan and Johannes Gehrke, Database management systems, Third Edition, 2002

**Course Outcomes:**

- Design and Implement a database schema for a given problem domain.

## **B.C.A. Computer Applications (CBCS)**

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- Populate and Query a database using SQL, DDL/DML Commands.
- Build well formed in String Date/Aggregate Functions.
- Design and Implement a database query using Joins, Sub-Queries and Set Operations.
- Program in SQL including Objects (Functions, Procedures, Triggers)

**ALLIED - 2**

**PAPER - 4**

**FINANCIAL ACCOUNTING - II**

**COURSE OBJECTIVE:**

- To develop the skills for recording the various kinds of Business Transactions.

**COURSE OUTCOME**

On successful completion of this course, the students will be able

**CO  
NUMBER**

**CO STATEMENT**

- |            |  |
|------------|--|
| <b>CO1</b> | To Understand the concept of Branch Accounting and enable the students to prepare Accounts for various types of Branches.        |
| <b>CO2</b> | To enhance the procedure for preparing Departmental Accounts.  |
| <b>CO3</b> | To Develop the skill of the students in preparing Hire Purchase Accounting, both in the books of Hire Purchaser and Hire Vendor. |
| <b>CO4</b> | To Understand the Accounting procedure for Partnership in cases like Admission, Retirement, Death.                               |
| <b>CO5</b> | To Understand the Accounting procedure for Dissolution and Insolvency of a Partner.  |

**Unit – I**

**BRANCH ACCOUNTS**

Branch Accounts – Objectives – Types of Branches – Debtors System (at cost price and Invoice Price) – Independent Branch.

**Unit – II**

**DEPARTMENTAL ACCOUNTS**

Departmental Accounts – Objectives – Distinction between Departments and Branches – Allocation of common expenses – Expenses which cannot be allocated – Inter Department transfer at cost price and selling price.

**Unit – III**

**HIRE PURCHASE SYSTEM**

Hire Purchase system – Meaning – Journal Entries and Ledger Accounts in the books of Hire Purchaser and Hire Vendor – Default and Repossession -Complete Repossession only.

**Unit – IV**

**PARTNERSHIP ACCOUNTS – I**

## **B.C.A. Computer Applications (CBCS)**

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Partnership Accounts – Admission of Partner– Retirement of Partner – Death of a Partner  
(Simple Problems)

### **Unit – V**

#### **PARTNERSHIP ACCOUNTS – II**

Dissolution of Partnership Firm - Insolvency of a Partner -Insolvency of all Partners (Garner vs. Murray). (Simple Problems)

**DISTRIBUTION OF MARKS: THEORY 20% AND PROBLEMS 80%**

#### **TEXT BOOK**

<b>S.No</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	T.S.Reddy and Murthy	Financial Accounting	Margham Publications	2018

#### **REFERENCE BOOKS**

<b>S.No</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	M.C. Shukla and T.S. Grewal&co	Advanced Accounts	S. Chand & Co	2016
2	R.L. Gupta	Financial Accounting	Sultan chand	2014
3	S.P. Jain &K.L Narang,	Financial Accounting	Kalyani Publication	2017
4	R.S.N Pillai&V.Bagavathi	Fundamental of Advanced Accounting, Volume – I	S. Chand & Co	2013

**SKILL BASED SUBJECT II**

**PAPER-2**

**INTERNET OF THINGS**

**Objectives**

- ✓ To learn about the basics of IOT protocols
- ✓ To understand the fundamentals of Internet of Things
- ✓ To build a small low cost embedded system using Raspberry Pi.
- ✓ To apply the concept of Internet of Things in the real world scenario.
- ✓ To understand the real world application concepts.

**UNIT I: INTRODUCTION TO IoT**

**9 Hours**

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology.

**UNIT II:IoT ARCHITECTURE**

**9**

**Hours**

M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture

**UNITIII: IoT PROTOCOLS**

**9**

**Hours**

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP– Security.

**UNIT IV: BUILDING IoT WITH RASPBERRY PI & ARDUINO**

**9**

**Hours**

Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board

- Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

### **UNIT V: CASE STUDIES AND REAL-WORLD APPLICATIONS**

**9**

#### **Hours**

Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.

#### **TEXT /REFERENCES BOOKS:**

1. ArshdeepBahga, Vijay Madiseti, —Internet of Things – A hands-on approach||, Universities Press, 2015
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things||, Springer, 2011.
3. Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspective||, CRC Press, 2012.
4. Jan Ho`ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocols||, Wiley, 2012

#### **Course Outcomes:**

- Analyze various protocols for IoT
- Develop web services to access/control IoT devices.
- Design a portable IoT using Raspberry Pi
- Deploy an IoT application and connect to the cloud.
- Analyze applications of IoT in real time scenario



**NON-MAJOR ELECTIVE**

**PAPER-2**

**INTERNET TECHNOLOGY**

**OBJECTIVS**

The subject aims to build the concepts regarding:

- Fundamentals of Internet, Connectivity and its Resource Requirements.
- To understand the Internet Technology and its applications
- To Understand WWW and Web Browsers.
- Mailing system and applications of Internet.
- To Understand relay chat

**UNIT-I**

**Introduction to internet:** What is Internet? Evolution and History of Internet- Growth of Internet-Owners of Internet- Internet Services- How does the Internet Works?-Anatomy of Internet-Internet Addressing-Internet vs Intranet-Impact of Internet- Governance of Internet.

**UNIT-II**

**Internet Technology and Protocol:** ISO-OSI Reference Model-**Internet Connectivity:** Getting Connected- Different Types of Connections- Levels of Internet Connectivity- Internet Service Provider. **Internet Tools and Multimedia:** Current Trends on Internet-Multimedia and Animation.

**UNIT-III**

**WWW and Web Browser:** WWW-Evolution of Web-Basic Elements of WWW-Web Browsers- Search Engines- Search Criteria. **Web Publishing:** Web Publishing- Web Page Design.

**UNIT-IV**

**Email:** E-Mail Basics- E-Mail System-E-Mail Protocol-E-Mail Addresses-Structure of an E-Mail Message-E-Mail Clients&Servers-MailingList-E-MailSecurity.

**UNIT-V**

**Usenet and Internet Relay Chat:** What is Usenet?-Newsgroup Hierarchies-What is a Newsreader?- How do you Read Newsgroups?- Who Administers Usenet?- Common News reading Tasks- How to Read Articles from Network News?- Relationship between Netnews and E-Mail-What is IRC?-Channels-Nicknames- Microsoft NetMeeting. **Internet and Web Security:** Overview of Internet Security- Aspects and Need of Security-E-Mail Threats and Secure E-mail-Web Security and Privacy Concepts-Firewall.

**TEXTBOOK:**

1. *ISRD Group*. 2012. **Internet Technology and Web Design**. [Fourth reprint]. Tata

McGraw-Hill Education Private Limited., New Delhi.

### **REFERENCE BOOKS:**

1. *Deitel, H.M. Dietel, P.J. and Goldberg A.B. 2008. Internet & Worldwide Web- How to Program.* [Third Edition]. PHL, New Delhi.
2. *Comdex. 2000. Teach yourself computers and the internet visually.* [First Edition]. IDG Book India (p) Ltd.
3. *Ramachandran, T.M. Nambissan. 2003. An Overview of internet and web development.* [First Edition]. T M-Dhruv Publications.

### **COURSE OUT COMES :**

- Students understand the Fundamentals of Internet, Connectivity and its Resource Requirements.
- Students understand the Internet Technology and its applications
- Students Understand the basis of WWW and Web Browsers.
- Students learn how to Mailing system and applications of Internet.
- Students Understand relay chat that is how to read e- contents.

**SEMESTER V**

**CORE PAPER - 9**

**MOBILE APPLICATIONS DEVELOPMENT**

**Objectives:**

To provide the students with a detailed knowledge on Mobile Application Development and Deployment about Android programming from basics to building mobile applications for digital world.

**UNIT I: INTRODUCTION TO ANDROID PLATFORM**

**Objective:** To understand the basics of smart phones and android platforms.

Introduction to Mobile Application Development – Various platforms– Smartphones–Android platform: features – Architecture – Versions–ART(Android Runtime)–ADB(Android Debug Bridge) –Development environment/IDE: Android studio and its working environment – Emulator setup –Application framework basics–XML representation and Android manifest file –Creating a simple application.

**UNIT II: ANDROID UI DESIGN**

**Objective:** To understand the basic concepts of user interface related to app development.

GUI for Android: activities lifecycle–Android v7 support library –Intent: Intent object – Intent filters– Adding categories – Linking activities – User Interface design components–Basic Views – Picker Views – List View –Specialized Fragment– Gallery and Image View – Image Switcher – Grid View, Options Menu – Context Menu – Clock View –Web view–Recycler View.

**UNIT III: DATA PERSISTENCE**

**Objective:** To understand the important of data persistence in mobile environment.

Different Data Persistence schemes: Shared preferences–FileHandling–Managing data using SQLite database –Content providers: user content provider– Android in build content providers.

#### **UNIT IV: ANDROID SERVICES & NETWORK ENVIRONMENT**

**Objective:** To understand the various services and network facilities provided by android platform.

Services: Introduction to services – Local service – Remote service – Binding the service –Communication between service and activity –Intent Service – Multi–Threading: Handlers – AsyncTask– Android network programming:URLConnection– Connecting to REST–based –SOAP based Web services –Broad cast receivers:LocalBroadcastManager–Dynamic broadcast receiver – System Broadcast –Telephony Manager:Sending SMS and making calls.

#### **UNIT V: ADVANCED APPLICATIONS**

**Objective:** To understand the various apps deployed and developed on by mobile platform.

Location based services: Google maps V2 services usingGoogle API–Animations and Graphics: Property Animation –View Animations –Drawable Animations – Media and Camera API: Working with video and audio inputs – camera API – Sensor programming: Motion sensors–Position sensors– Environmental sensors –Publishing Android Apps: Guide lines– policies and processof uploading Apps to Google play.

#### **TEXT BOOKS:**

1. “Head First: Android Development”, Dawn Griffiths, David Griffiths, OReilly, 1<sup>st</sup> Edition, 2015.
2. Barry Burd, “Android Application Development – All–in–one for Dummies”, 2nd Edition,Wiley India, 2016.

#### **REFERENCES:**

1. “Professional Android™ Sensor Programming”,Greg Milette,Adam Stroud, John Wiley and Sons, Inc2012.
2. “Android 6 for Programmers, App Driven approach”, Paul Deital, Harvey Deital, Alexander Wald, Prentice Hall, 2015.

**OPERATING SYSTEM**

**Objectives:** Enable the student to get sufficient knowledge on concepts, functions and various system resources of operating systems.

**UNIT I: OPERATING SYSTEM BASICS**

**Objective:** To understand the structure and functions of operating systems.

Basic Concepts of Operating System – Services of Operating System – Operating System Types – Computer System Operation – I/O Structure – Storage Structure – Memory Hierarchy – System Components – System Calls – System Programs – System Design and Implementation – Introduction to Process – Process State – Process Control Block – Process Scheduling – Operations on Process – Interprocess Communication – Communication in Client/Server Systems – Threads .

**UNIT II: CPU SCHEDULING ALGORITHM AND PREVENTION**

**Objective:** To understand the principles of scheduler, scheduler algorithms and Deadlock.

Types of CPU Scheduler – Scheduling Criteria – Scheduling Algorithms – Semaphores – Classic Problems of Synchronization – Basic Concept of Deadlocks – Deadlock Characterization – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery of Deadlock.

**UNIT III: STORAGE MANAGEMENT**

**Objective:** To learn various memory management schemes.

Memory Management – Basics Concept of Memory – Address Binding – Logical and Physical Address Space – Memory Partitioning – Memory Allocation – Paging – Segmentation – Segmentation and Paging – Protection – Fragmentation – Compaction – Demand Paging – Page Replacement Algorithm – Classification of Page Replacement Algorithm .

**UNIT IV: I/O SYSTEMS**

**Objective:** To study I/O management, File system and Mass Storage Structure.

File System Storage – File Concept– File Access Methods – Directory Structure – File Sharing – File Protection – File System Implementation – File System Structure – Allocation Methods – Free Space Management – Mass Storage Structure – Disk structure – Disk Scheduling and Management – RAID Levels.

### **UNIT V: CASE STUDIES**

**Objective:** To learn the basics of UNIX, LINUX systems and perform administrative tasks on LINUX servers.

UNIX System – A Case Study – LINUX System – Case Study – Design Principles – Process Management – Scheduling – Memory Management – File Systems – Security .

#### **TEXT BOOKS:**

1. “Operating System Concepts” –Abraham Silberschatz Peter B. Galvin, G. Gagne, Sixth Edition, Addison Wesley Publishing Co., 2003.
2. “Operating System” – Willam Stalling, Fourth Edition, Pearson Education,2003.

#### **REFERENCES:**

1. “Operating systems – Internals and Design Principles”, W. Stallings, 6th Edition, Pearson.
2. “Modern Operating Systems”, Andrew S.Tanenbaum, Second Edition Addison Wesley, 2001.
3. “Fundamentals of Operating System”, Prof. R. Sridhar, Dynaram Publication, Bangalore Company.

**CORE PAPER - 11**

**DESIGN AND ANALYSIS OF ALGORITHMS**

**Objectives:** To build a solid foundation of the most important fundamental subject in computer science. Creative thinking is essential to algorithm design and mathematical Acumen and programming skills.

**UNIT – I: ALGORITHM AND ANALYSIS**

**Objective:** Understanding various algorithm design techniques.

Elementary Data Structures: Stack – Queues – Trees – Priority Queue – Graphs – What is an Algorithm? – Algorithm Specification – Performance Analysis: Space Complexity – Time Complexity – Asymptotic Notation – Randomized Algorithms.

**UNIT – II: DIVIDE AND CONQUER**

**Objective:** This technique is the basis of efficient algorithms for all kinds of problems.

General Method – Binary Search – Recurrence Equation for Divide and Conquer – Finding the Maximum and Minimum— Merge Sort – Quick Sort – Performance Measurement – Randomized Sorting Algorithm – Selection Sort – A Worst Case Optimal Algorithm – Implementation of Select2 – Stassen’s Matrix Multiplications.

**UNIT – III: THE GREEDY METHOD**

**Objective:** This is a simple approach which tries to find the best solution at every step.

The General Method – Container Loading – Knapsack Problem – Tree Vertex Splitting – Job Sequencing with Deadlines – Minimum Cost Spanning Trees – Prim’s Algorithm – Kruskal’s Algorithm – An optimal Randomized Algorithm – Optimal Storage on Tapes – Optimal Merge Pattern – Single Source Shortest Paths.

**UNIT – IV: DYNAMIC PROGRAMMING, TRAVERSAL & SEARCHING**

**Objective:** Providing a general insight into the dynamic programming approach.

The General Method – Multistage Graphs – All Pair Shortest Path – Optimal Binary Search Trees – String Editing – 0/1 Knapsack – Reliability Design – The

Traveling Salesperson Problem. Techniques for Binary Trees – Techniques for Graphs – BFS – DFS.

### **UNIT – V: BACKTRACKING & BRANCH AND BOUND**

**Objective:** Algorithm design paradigm for discrete and combinatorial optimization problems.

The General Method – The 8– Queens Problem – Sum of Subsets– Graph Coloring – Hamiltonian Cycles – Branch and Bound: General Method – LC Branch and Bound – FIFO Branch and Bound.

#### **TEXT BOOKS:**

1. “Fundamentals of Computer Algorithms”, Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, Galgotia Publications, Second Edition 2015.
2. “Introduction to Algorithms”, Cormen T.H., Leiserson C.E. and Rivest R.L., PHI Publications, Third Edition, 1998.

#### **REFERENCES:**

1. “Introduction to the Design and Analysis of Algorithms”, AnanyLevitin, Pearson Education, 2nd Edition.
2. “Introduction to Algorithms” Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, Prentice Hall of India, New Delhi, Second Edition, 2007.
3. “Computer Algorithms – Introduction to Design & Analysis” Sara Baase and Allen Van Gelder, Pearson Education New Delhi, Third Edition, 2000.

**CORE PRACTICAL (Practical - 5)**

**MOBILE APPLICATIONS DEVELOPMENT LAB**

1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Intent and Activity.
3. Develop an application that uses Layout Managers and event listeners.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of RSS Feed.
6. Implement an application that implements Multi threading.
7. Develop an application that create alarm clock.
8. Develop an application Using Widgets.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Develop an application that makes use of database.

**CORE PRACTICAL (Practical - 6)**

**OPERATING SYSTEM LAB**

1. Basics of UNIX commands.
2. Shell Programming.
3. Implement the following CPU scheduling algorithms
  - a) Round Robin b) SJF c) FCFS d) Priority
4. Implement all file allocation strategies
  - a) Sequential b) Indexed c) Linked
5. Implement Semaphores
6. Implement all File Organization Techniques
  - a) Single level directory b) Two level c) Hierarchical d) DAG
7. Implement Bankers Algorithm for Dead Lock Avoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement e all page replacement algorithms
  - a) FIFO b) LRU c) LFU
10. Implement Shared memory and IPC
11. Implement Paging Technique of memory management.
12. Implement Threading & Synchronization Applications.

**INTERNAL ELECTIVE**

**PAPER - 1**

**(to choose one out of 3)**

**A. DATA MINING**

**Objectives:** To enable the students to understand the importance of Data Mining and its techniques with recent trends and tools.

**UNIT I: DATA MINING BASICS**

**Objective:** To understand about the basics of Data Mining and Data

What is Data Mining– Kinds of Data – Kinds of patterns – Technologies used for Data Mining– Major Issues in Data Mining– Data –Data Objects and Attribute types– Data Visualization– Measuring Data Similarity and Dissimilarity–Data Preprocessing– overview– Data Cleaning– Data Integration– Data Reduction– Data Transformation and Data Discretization.

**UNIT II: DATA WAREHOUSING AND ONLINE ANALYTICAL PROCESSING**

**Objective:** To understand about the methods of Data Warehousing

Data Warehouse– Basic concepts–Data Warehouse Modelling: Data Cube and OLAP– Data Warehouse Design and Usage– Data Warehouse Implementation– Data Generalization by Attribute–Oriented Induction– Data Cube Technology– Data Cube Computation Methods– Exploring Cube Technology– Multidimensional Data Analysis in cube space.

**UNIT III: PATTERNS AND CLASSIFICATION**

**Objective:** To understand about the techniques of Data Mining

Patterns– Basic concepts– Pattern Evaluation Methods–Pattern Mining: Pattern Mining in Multilevel– Multidimensional space–Constraint–Based Frequent Pattern Mining– Mining High Dimensional Data and Colossal patterns– Mining compressed or Approximate patterns– Pattern Exploration and Application. Classification–Decision tree Induction– Bayes Classification methods– Rule based Classification– Model Evaluation and selection– Techniques to Improve Classification Accuracy– Other Classification methods.

#### **UNIT IV: CLUSTERING AND OUTLIER DETECTION**

**Objective:** To understand about the importance of Cluster and outlier detection

Cluster Analysis– Partitioning Methods – Hierarchical Methods – Density – Based Methods– Grid – Based Methods – Evaluation of Clustering.– Clustering High – Dimensional Data–Clustering Graph and Network Data – Clustering with Constraints – Web Mining – Spatial Mining. Outlier Detection – Outliers and Outliers Analysis – Outlier Detection Methods–Outlier Approaches – Statistical – Proximity–Based – Clustering–Based– Classification Based – High– Dimensional Data.

#### **UNIT V: RECENT TRENDS IN DATA MINING AND TOOLS**

**Objective:** To improve the student’s knowledge with recent trends and tools

Other Methodologies of Data Mining – Data Mining Applications – Data Mining Trends – Recent Data Mining Tools – Rapidminer – Orange – Weka–Klime– Sisense –Ssd (SQL Server Data Tools) – Oracle – Rattle – Data melt – Apache Mahout.

#### **TEXT BOOKS:**

1. “Data Warehousing Fundamentals”, PaulrajPonnaiah, Wiley Publishers, 2001.
2. “Data Mining: Concepts and Techniques”, Jiawei Han, MichelineKamber, Morgan Kaufman Publishers, 2006.
3. “Introduction to Data mining with case studies”, G.K. Gupta, PHI Private limited, New Delhi, 2008. 2<sup>nd</sup> Edition, PHI, 2011

#### **REFERENCES:**

1. “Advances in Knowledge Discover and Data Mining”, Usama M. Fayyad, Gregory Piatetsky Shapiro, Padhrai Smyth RamasamyUthurusamy, the M.I.T. Press, 2007.

2. "The Data Warehouse Toolkit", Ralph Kimball, Margy Ross, John Wiley and Sons Inc., 2002
3. "Building Data Mining Applications for CRM", Alex Berson, Stephen Smith, Kurt Thearling, Tata McGraw Hill, 2000.
4. "Data Mining: Introductory and Advanced Topics", Margaret Dunham, Prentice Hall, 2002.
5. "Discovering Knowledge in Data: An Introduction to Data Mining", Daniel T. Larose John Wiley & Sons, Hoboken, New Jersey, 2004

**INTERNAL ELECTIVE**

**PAPER - 1**

**B. INFORMATION SECURITY**

**Objectives:** To enable the student to understand various methodologies available for securing information.

**UNIT I: INFORMATION SECURITY BASICS**

**Objective: To understand the basic concepts of Information Security**

Introduction –History – What is Information Security? – Critical Characteristics of Information – NSTISSC Security Model – Components of an Information System – Securing the Components – Balancing Security and Access – The SDLC – The Security SDLC.

**UNIT II SECURITY INVESTIGATION**

**Objective: To understand the legal, ethical and professional issues in Information Security**

Security – Business Needs – Threats – Attacks – Legal – Ethical and Professional Issues – Relevant U.S. Laws – International Laws and Legal Bodies – Ethics and Information Security – Codes of Ethics and Professional Organizations

**UNIT III SECURITY ANALYSIS**

**Objective: To know about risk management**

Risk Management – Introduction – An Overview of Risk Management – Risk Identification – Risk Assessment – Risk Control Strategies – Selecting a Risk Control Strategy –Quantitativeversus Qualitative Risk Control Practices – Risk Management Discussion Points

**UNIT IV SECURITY MODELS**

**Objective: To understand the technological aspects of Information Security**

Logical Design – Blueprint for Security – Information Security Policy – Standards and Practices– ISO 17799/BS 7799– NIST Models– VISA International

Security Model – Design of Security Architecture – Planning for Continuity – Security Physical Design – Firewalls – Security Technology – IDS – IPS – Honey Pots – Honey Nets – Padded cell Systems Scanning and Analysis Tools – Access Control Devices.

#### **UNIT V: CRYPTOGRAPHY AND ETHICAL HACKING**

**Objective: To understand the concepts of Cryptography and Hacking methods**

Cipher methods – Cryptographic Algorithms and Tools – Attacks on Cryptosystems – Hacking – Effects of Hacking – Hacker – Types of Hacker – Ethical Hacker – Hacktivism – Networking & Computer Attacks – Malicious Software (Malware) – Protection Against Malware – Intruder Attacks on Networks and Computers – Wireless Hacking – Windows Hacking – Linux Hacking Session.

#### **TEXT BOOKS:**

1. “Principles of Information Security”, Michael E Whitman and Herbert J Mattord, 5<sup>th</sup> Edition, Vikas Publishing House, New Delhi, 2003.
2. “Fundamentals of Information Systems Security”, David Kim, Michael G. Solomon, 3<sup>rd</sup> Edition, Jones & Bartlett Learning, October 2016.
3. “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy”, Patrick Enebreton, 2<sup>nd</sup> Edition, Syngress Basics Series – Elsevier, 2011.
4. “Hands-On Ethical Hacking and Network Defense”, Michael T. Simpson, Kent Backman, James E. Corley, Second Edition, CENGAGE Learning, 2010.

#### **REFERENCES:**

1. “Handbook of Information Security Management”, Micki Krause, Harold F. Tipton, sixth Edition, CRC Press LLC, 2004.
2. “Hacking Exposed”, Stuart McClure, Joel Scrambray, George Kurtz, Tata McGraw–Hill, 2003.

3. "Computer Security Art and Science", Matt Bishop, 2<sup>nd</sup> Edition , Pearson/PHI, 2002.

**INTERNAL ELECTIVE**

**PAPER - 1**

**C. SOFTWARE TESTING**

**Objectives:**

To study the concepts of software engineering with the aim of acquiring skills to develop Software applications, following all standardized procedures and techniques.

**UNIT I: INTRODUCTION TO SOFTWARE TESTING**

**Objective:** To understand the concept of software testing, and software quality

Fundamentals of software testing – need for software testing– Psychology of testing – various approaches – characteristics of testing – principles of testing – testing strategies – verification and validation – Defect and Prevention strategies.

**UNIT II: SOFTWARE DEVELOPMENT MODEL AND TESTING**

**Objective:** To learn to inspect and detect errors by going through each and every code segment

Water fall model– V–model– Spiral model– Agile model – Life cycle of testing– Static Testing – dynamic testing – White box testing – Block box testing – Regression testing – Integration Testing – System and Performance Testing – Usability Testing

**UNIT III: FUNCTIONAL AND STRUCTURAL TESTING**

**Objective:** To gain knowledge of various functional and structural testing techniques

Boundary Value Analysis – Equivalence Class Testing – Decision Table – Based Testing – Cause Effect Graphing Technique – Path testing –Cyclomatic Complexity – Graph Metrics – Data Flow Testing – Slice based testing

**UNIT IV: TEST MANAGEMENT AND TOOLS**

**Objective:** To understand basic concept of Software Management tools and object oriented testing

Test planning – cost–benefit analysis of testing – monitoring and control– test reporting – test control – Specialized testing – Object Oriented Testing – Automated Tools for Testing – Tool Selection and Implementation – Challenges in test automation– GUI Testing

### **UNIT V: SOFTWARE QUALITY AND SOFTWARE QUALITY ASSURANCE**

**Objective:** To understand basic concept of Software quality and software quality assurance

Introduction to software quality and software quality assurance – basic principles about the software quality and software quality assurance – Planning for SQA – various models for software product quality and process quality – SCM – RAD – System Documentation

#### **TEXT BOOKS:**

1. “Software Testing– A Craftsman’s Approach” – Paul C. Jorgensen – Second Edition – CRC Press 2008
2. “Software Testing”, – Ron Patton, Second Edition –Sams Publishing, Pearson Education, 2007.
3. “Software Testing– A Craftsman’s Approach” – Paul C. Jorgensen, Second Edition – CRC Press, 2008

#### **REFERENCES:**

1. “Software Testing and Analysis: Process, Principles and Techniques” – Mauro Pezze, Michal Young – Wiley India , 2008
2. “Software Engineering” – K.K. Aggarwal&Yogesh Singh – New Age International Publishers – New Delhi, 2003.
3. “Software Testing – Principles and Practices” –SrinivasanDesikan and Gopalswamy Ramesh, Pearson Education, 2006.

**SKILL BASED SUBJECT  
PAPER-3**

**SOFTWARE ENGINEERING**

**Objectives:**

This course is intended to provide the students with an overall view over Software Engineering discipline and with insight into the processes of software development.

**UNIT-I: INTRODUCTION TO EVOLVING SOFTWARE**

**Objective:** Introduces the concepts and methods required for the construction of large software intensive systems.

Evolving Role of Software – Nature of Software – Software Engineering – The Software Process– Software Engineering Practices – Software Myths – A Generic View of Process Model – Process Assessment and Improvement – Process Models : Waterfall Model – Incremental Process Models – Evolutionary Process Models – Concurrent Models.

**UNIT-II: REQUIREMENTS ENGINEERING**

**Objective:** Gets the idea of choosing the Requirements in Software Engineering.

Requirements Engineering: Establishing the Groundwork – Initiating the Requirements Engineering Process – Eliciting Requirements – Collaborative Requirements Gathering – Quality Function Deployment – Usage Scenarios – Elicitation work Products – Building the Requirements Model – Elements of Requirements Model – Analysis Pattern – Requirements Analysis – Data Modeling Concepts.

**UNIT-III: DATA ENGINEERING**

**Objective:** Gives an understanding the concept of Data Engineering.

Data Engineering: Design Process and Design Quality – Design Concepts – The Design Model - Creating an Architectural Design – Software Architecture – Data Design – Architectural style – Architectural Design – Architectural Mapping Using Data Flow – Performing User Interface Design – Golden Rules.

**UNIT-IV: TESTING STRATEGIES**

**Objective:** To impart knowledge on Testing and Debugging.

Testing Strategies: Strategic Approach to Software Testing – Strategic Issues – Test Strategies for Conventional and Object Oriented Software – Validation Testing – System Testing – Art of Debugging. Software Testing Fundamentals – White Box Testing – Basis Path Testing – Control Structure Testing – Black Box Testing – Model Based Testing.

### **UNIT–V: PROJECT MANAGEMENT**

**Objective:** To enable the students to learn the basic of Project Management & Scheduling.

Project Management: Management Spectrum – People – Product – Process – Project – Critical Practices – Estimation: Project Planning Process – Software Scope and Feasibility – Resources – Software Project Estimation – Project Scheduling – Quality Concepts – Software Quality Assurance – Elements of Software Quality Assurance – Formal Technical Reviews.

### **TEXT BOOKS:**

1. "Software Engineering – A Practitioner's Approach", Roger S Pressman, McGraw Hill International Edition, New York: 2005, Seventh Edition
2. " Software Engineering", Mall Rajib, PHI Learning, 2009, 3 Third Edition.

### **REFERENCES:**

1. "Software Engineering", Ian Sommerville, Pearson Education, 2006, 7th Edition.
2. "Software Engineering Concepts" Richard Fairley, Tata McGraw–Hill Education, 2011.
3. "Software Engineering: Theory and Practice ", Pfleeger and Lawrence, Pearson Education, 2001, Second Edition.

**SEMESTER VI**

**CORE PAPER - 12**

**OPEN SOURCE SOFTWARE**

**Objectives:**

To study the concepts of open source techniques that can be effectively applied in practice about HTML5, JavaScript, PHP, and PERL.

**UNIT I: INTRODUCTION TO HTML, CSS**

**Objective:** To understand the concept of HTML, HTML5 and CSS.

Need of Open Source –Advantages of Open source –Application of Open Source – HTML – HTML tags –Dynamic Web content– HTTP Request and Response Procedure–Introduction to HTML5– HTML5 Canvas – HTML5 Audio and Video–Introduction to CSS– CSS Rules–Style Types–CSS Selectors– CSS Colors.

**UNIT II: LINUX**

**Objective:** To learn to inspect and detect errors by going through each and every code segment.

Introduction: Linux Essential Commands – Kernel Mode and user mode – File system Concept – Standard Files – The Linux Security Model – Vi Editor – Partitions Creation – Shell Introduction – String Processing – Investigation and Managing Processes – Network Clients – Installing Application.

**UNIT III: JAVA SCRIPT AND MYSQL**

**Objective:** To understand basic concept of Java Script and MySQL.

Java script :Advantages of JavaScript –JavaScript Syntax–Data type– Variable– Array – Operators and Expressions– Loops – functions – Dialog box– MySQL –

The show Databases and Table – The USE command – Create Database and Tables – Describe Table – Select, Insert, Update, and Delete statement.

### **UNIT IV: PHP**

**Objective:** To understand basic concept of PHP

PHP Introduction – General Syntactic Characteristics – PHP Scripting – Commenting your code – Primitives, Operations and Expressions – PHP Variables – Operations and Expressions Control Statement – Array – Functions – Basic Form Processing – File and Folder Access – Cookies – Sessions – Database Access with PHP.

### **UNIT V: PERL**

**Objective:** To understand basic concept of PERL

PERL : Perl backgrounder – Perl overview – Perl parsing rules – Variables and Data – Statements and Control structures – Subroutines, Packages, and Modules – Working with Files – Data Manipulation.

### **TEXT BOOKS:**

1. “The Complete Reference Linux”, Peterson, Tata McGraw HILL–2010
2. “Perl: The Complete Reference”, Martin C. Brown, Tata McGraw Hill Publishing Company Limited, Indian Reprint 2009.
3. “MYSQL: The Complete Reference”, VikramVaswani, 2nd Edition, Tata McGrawHill Publishing Company Limited, Indian Reprint 2009
4. “PHP: The Complete Reference”, Steven Holzner, 2nd Edition, Tata McGrawHill Publishing Company Limited, Indian Reprint 2009.
5. “Complete Reference HTML”, T. A. Powell, 3rd Edition, Tata McGrawHill Publishing Company Limited, Indian Reprint 2002.
6. “Mastering Java script” –J. Jaworski, BPB Publications, 1999

### **REFERENCES:**

1. “Fundamentals of Open Source Software”, by M.N. Rao, PHI publishers.
2. “MySQL Bible”, Steve Suchring, John Wiley, 2002
3. “The Linux Kernel Book”, Remy Card, Eric Dumas and Frank Mevel, Wiley Publications, 2003
4. Ivan Byross, HTML, DHTML, Javascript, Perl, BPB Publication



**CORE PAPER - 13**

**PYTHON PROGRAMMING**

**UNIT I:**

Identifiers – Keywords - Statements and Expressions – Variables – Operators – Arithmetic operators – Assignment operators – Comparison operators – Logical operators – Bitwise operators - Precedence and Associativity – Data types - Number – Booleans – Strings - Indentation – Comments – Single line comment – Multiline comments - Reading Input – Print Output – Type Conversions – int function – float function – str() function – chr() function – complex() function – ord() function – hex() function – oct() function - type() function and Is operator – Dynamic and Strongly typed language.

**UNIT II:**

Control Flow Statements – If statement – If else statement – If elif else statement – nested if statement - while loop – for loop – continue and break statements – catching exceptions using try and except statement – syntax errors – exceptions – exception handling – Strings – str() function - Basic string operations – String comparison – Built in functions using strings – Accessing characters in string – String slicing – String joining – split() method – string traversing.

**UNIT III:**

Functions – Built in functions – function definition and calling - return statement – void function – scope and lifetime of variables – args and kwargs – command line arguments - Tuples – creation – basic tuple operations – tuple() function – indexing – slicing – built-in functions used on tuples – tuple methods – packing – unpacking – traversing of tuples – populating tuples – zip() function - Sets – Traversing of sets – set methods – frozenset.

### **UNIT IV:**

Lists: Using List- List Assignment and Equivalence – List Bounds- Slicing - Lists and Functions- Prime Generation with a List. List Processing: Sorting-Flexible Sorting- Search- List Permutations- Randomly Permuting a List- Reversing a List.

### **UNIT V:**

Objects: Using Objects- String Objects- List Objects. Custom Types: Geometric Points- Methods- Custom Type Examples- Class Inheritance. Handling Exceptions: Motivation- Exception Examples- Using Exceptions - Custom Exceptions.

### **TEXT BOOKS:**

1. Gowrishankar S, Veena A, "Introduction to Python programming", 1<sup>st</sup> Edition, CRC Press/Taylor & Francis, 2008. (Units 1-3)
2. Learn to Program with Python, 3th Edition, Richard L. Halterman, Southern Adventist University. (Units 4-5)

### **REFERENCE BOOKS:**

1. Core Python Programming, 2thEdition, Wesley J. Chun, Prentice Hall.
2. Jake VanderPlas,"Python Data Science Handbook:Essential Tools for working with Data",1<sup>st</sup> edition, O'Reilly Media, 2016.

**CORE PRACTICAL (PRACTICAL-7)**

**PYTHON PROGRAMMING LAB**

1. Write a Python program to find the area and perimeter of a circle.
2. Write a Python program to generate Fibonacci series.
3. Write a Python program to compute the GCD of two numbers.
4. Write a Python program to generate first n prime numbers.
5. Write a Python program to find the sum of squares of n natural numbers.
6. Write a Python program to find the sum of the elements in an array.
7. Write a Python program to find the largest element in the array.
8. Write a Python program to check if the given string is a palindrome or not.
9. Write a Python program to store strings in a list and print them.
10. Write a Python program to find the length of a list, reverse it, copy it and then clear it.

**OPEN SOURCE SOFTWARE LAB**

**CORE PRACTICAL (Practical– 8)**

1. Create a web page with Frames and Tables.
2. Create a web page incorporating CSS (Cascading Style Sheets).
3. Write a shell program to find the factorial of an integer positive number.
4. Write a shell program to find the details of a user session.
5. Create a simple calculator in JavaScript.
6. Write a JavaScript program to scroll your name in the scrollbar.
7. Develop a program and check message passing mechanism between pages.
8. Application for Email Registration and Login using PHP and MySQL.
9. Program to Create a File and write the Data into it using PHP.
10. Program to perform the String Operation using Perl.

**INTERNAL ELECTIVE - 2**

**PAPER-2**

**(to choose one out of 3)**

**A. BIG DATA ANALYTICS**

**Objectives:**

- To explore the fundamental concepts of big data analytics.
- To learn to analyze the big data using intelligent techniques and mining data stream.
- To understand the applications using Map Reduce Concepts.

**UNIT-I: INTRODUCTION TO BIG DATA**

**Objective: To explore the fundamental concepts of big data analytics.**

Introduction to big data: Introduction to Big Data Platform – Challenges of Conventional Systems – Intelligent data analysis – Nature of Data – Characteristics of Data – Evolution of Big Data – Definition of Big Data – Challenges with Big Data – Volume, Velocity, Variety – Other Characteristics of Data – Need for Big Data – Analytic Processes and Tools – Analysis vs. Reporting.

**UNIT-II: MINING DATA STREAMS**

**Objective: To learn to use various techniques for mining data stream.**

Mining data streams: Introduction To Streams Concepts – Stream Data Model and Architecture – Stream Computing – Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window – Real time Analytics Platform (RTAP) Applications – Case Studies – Real Time Sentiment Analysis – Stock Market Predictions.

**UNIT III: BIG DATA FROM DIFFERENT PERSPECTIVES**

**Objective: To learn the Big data Business Perspective**

Big data from business Perspective: Introduction of big data – Characteristics of big data – Data in the warehouse and data in Hadoop – Importance of Big data – Big data Use cases – Patterns for Big data deployment. Big data from

Technology Perspective:–Application Development in Hadoop–Getting your data in Hadoop.

### **UNIT –IV:HADOOP AND MAP REDUCE**

**Objective:To understand the applications using Map Reduce Concepts.**

Hadoop: The Hadoop Distributed File System – Components of Hadoop Analysing the Data with Hadoop– Scaling Out–Hadoop Streaming– Design of HDFS–Java interfaces to HDFS Basics– Developing a Map Reduce Application–How MapReduce Works–Anatomy of a Map Reduce Job run– Failures–Job Scheduling–Shuffle and Sort – Task execution – Map Reduce Types and Formats– Map Reduce Features–Hadoop environment.

### **UNIT – V:FRAMEWORKS**

**Objective:To introduce programming tools HIVE in Hadoop ecosystem.**

Frameworks: Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive – fundamentals of HBase and ZooKeeper– IBM InfoSphere Big Insights and Streams.

### **TEXT BOOKS:**

1. “Intelligent Data Analysis”, Michael Berthold, David J. Hand, Springer, 2007.
2. “Hadoop: The Definitive Guide “, Tom White Third Edition, O'Reilly Media, 2012.

### **REFERENCES:**

1. “Big Data and Analytics” Seema Acharya, Subhasini Chellappan, Wiley 2015.
2. “Mining of Massive Datasets”, Anand Rajaraman and Jeffrey David Ullman, CUP, 2012.
3. “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data” .Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, McGrawHill Publishing, 2012.
4. “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, Bill Franks, John Wiley & sons, 2012.

5. “Making Sense of Data”, Glenn J. Myatt, John Wiley & Sons, 2007.

**INTERNAL ELECTIVE**

**PAPER-2**

**B. CRYPTOGRAPHY**

**Objectives:**

- Understand various Security practices and System security standards
- Understand different cryptographic operations
- Understand the various Authentication schemes to simulate different applications.

**UNIT – I: COMPUTER AND NETWORK SECURITY**

**Objective:** Understand OSI security architecture and classical encryption techniques.

Computer Security Concepts –OSI security architecture –Security trends– Security attacks – Security Services– Security Mechanisms –Fundamental Security Design Principles – Attack Surfaces and Attack Trees – Model for Network Security – Network Standards.

**UNIT – II:SYMMETRIC CRYPTOGRAPHY**

**Objective:** Understand the different cryptographic operations of symmetric cryptographic algorithms.

Symmetric Cipher – Classical Encryption Technique – Symmetric Cipher Model – Substitution Techniques, Transposition Technique – Steganography – Block Cipher and the Data Encryption Standard – The Data Encryption Standard – Differential and Linear Cryptanalysis – Block Cipher Principles.Advanced Encryption Standard – AES Structure – AES Transformation Function.

**UNIT – III:PUBLIC KEY CRYPTOGRAPHY**

**Objective:**Understand the different cryptographic operations of Public key cryptographic algorithms.

Public Key Cryptography and RSA Principles– RSA Algorithm, Key Management and other Public Key Cryptosystems Key Management, Diffie–Hellman Key Exchange, Elliptic Curve Arithmetic – Elliptic Curve Cryptography – Pseudorandom Number Generation.

### **UNIT –IV:HASH FUNCTIONS AND DIGITAL SIGNATURES**

**Objective:** To make use of application protocols to design and manage a secure system.

Cryptographic Hash Functions – Application of Hash Functions – Two Simple Hash Functions – Secure Hash Algorithm(SHA) –Message Authentication Codes –Authentication requirement – Authentication function – MAC – HMAC – CMAC – Digital signature and authentication protocols – Digital Signature Standards –Digital Signatures Schemes– Digital Certificate – Key Management and Distribution.

### **UNIT –V: SECURITY APPLICATIONS**

**Objective:**To learn the configuration and manage E–mail and WLAN Security.

Intrusion Detection System– Password Management – Introduction to Firewall– Firewall Generations– Web Security – Wireless network Security – Electronic Mail Security– Internet Mail Architecture–S/MIME – Pretty Good Privacy (PGP).

#### **TEXT BOOKS:**

1. “Cryptography and Network security Principles and Practices”,William Stallings,Pearson/PHI,Seventh Edition, 2017.
2. “CRYPTOGRAPHY & NETWORK SECURITY” – Principles and Practices, William Stallings, Pearson Education, Third Edition.

#### **REFERENCES:**

1. “Modern Cryptography Theory and Practice”, Wenbo Mao, Pearson Education, 2004.
2. “Cryptography and Network Security “,BehourzForouzan, DebdeepMukhopadyay,Tata McGraw Hill Education Pvt. Ltd, New Delhi, 2010.

3. “Quantum Cryptography and Secret–Key Distillation”, Gilles van Assche, Cambridge University Press, 2010.

**INTERNAL ELECTIVE**

**PAPER-2**

**C. DIGITAL IMAGE PROCESSING**

**Objectives:**

This course enables the student knowledge about various image processing concepts like enhancement, restoration, segmentation, compression and recognition.

**UNIT – I: FUNDAMENTALS**

**Objective:** To know the basics of Digital image and techniques.

Introduction – Origin – Steps in Digital Image Processing – Components – Applications of DIP – Elements of Visual Perception – Light and Electro Magnetic Spectrum – Image Sensing and Acquisition – Image Sampling and Quantization – Images in Matlab– Pixels – Color models– Digital Image Processing in Multimedia.

**UNIT – II: IMAGE ENHANCEMENT**

**Objective:** To understand various Image enhancement ideas.

Spatial Domain – Gray level transformations – Histogram Quantization – Histogram matching and processing – Basics of Spatial Filtering – Smoothing and Sharpening Spatial Filtering – Introduction to Fourier Series – Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal – Butterworth and Gaussian filters

**UNIT – III: IMAGE RESTORATION AND SEGMENTATION**

**Objective:** To understand Image restoration techniques.

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse

Filtering – Wiener filtering Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation– Active Contour Models – Snakes – Fuzzy Connectivity – Morphological processing– erosion and dilation.

### **UNIT – IV: WAVELETS AND IMAGE COMPRESSION**

**Objective:** To understand degrees of image resolution and compression methods.

Wavelets – Subband coding – Multi resolution expansions – Compression: Fundamentals – Image Compression models – Error Free Compression – Predictive Compression Methods – Vector Quantization – Variable Length Coding – Bit–Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards

### **UNIT – V: IMAGE REPRESENTATION AND RECOGNITION**

**Objective:** To understand concepts of image representation and recognition.

Knowledge Representation – Statistical Pattern Recognition – Neural Nets – Fuzzy Systems – Chain Code – Polygonal approximation, signature, boundary segments – Shape number – Fourier Descriptor moments – Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.

### **TEXT BOOKS**

1. "Digital Image Processing," Rafael C. Gonzalez, Richard E.Woods, Prentice Hall, Third Edition, 2008.
2. "Digital Image Processing and Computer Vision," Sonka, Hlavac, Boyle, Cengage Learning, 2009
3. "Fundamentals of Digital Image Processing", Anil Jain K, PHI Learning Pvt. Ltd., 2011.

### **REFERENCES:**

1. "Digital Image Processing", S. Sridhar, Oxford University Press; Second edition, 2016.
2. "Digital Image Processing", Gonzalez &woods, Pearson Education India, 2016.



**INTERNAL ELECTIVE**

**PAPER - 3**

**(to choose one out of 3)**

**A. ARTIFICIAL INTELLIGENCE**

**Objectives:**

To induce the innovative ideas of students, related to Robotics, Artificial Intelligence and Machine Learning. This course enables the student's level to compete in the world of information and technology era.

**UNIT I: INTRODUCTION TO ARTIFICIAL INTELLIGENCE:**

**Objective:**To know the basics of Artificial Intelligence.

History of AI – Artificial Narrow Intelligence (ANI) – Artificial General Intelligence (AGI) – Artificial Super Intelligence (ASI) – Characteristics – Types of AI – Domains – Programming Languages of AI – Applications of AI – Future of AI.

**UNIT II: AI – PROBLEM SOLVING METHODS:**

**Objective:**To Understand the Methods and algorithms in AI.

Problem solving Methods – Search Strategies: Uninformed – Informed – Heuristics – Generate and test – hill climbing – Best first search – problem reduction – Local Search Algorithms and Optimization – Game Playing mini-max procedure – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games

**UNIT III: AI – KNOWLEDGE REPRESENTATION:**

**Objective:**To learn to represent knowledge in solving AI problems.

Procedural Versus declarative knowledge – logic programming – Forward Versus backward reasoning – Matching – Control knowledge – Ontological Engineering– Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories –Reasoning with Default Information.

**UNIT IV: STATISTICAL REASONING AND AGENTS:**

**Objective:**To Understand Statistical logics and know about Software agents.

Probability and Bayes Theorem – Certainty factors – Probabilistic Graphical Models – Bayesian Networks – Markov Networks – Fuzzy Logic. Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

### **UNIT V: MACHINE LEARNING AND APPLICATIONS**

**Objective:**To learn how Machine learning is related to AI.

Types of Machine Learning – Neural Networks – Deep Learning – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

#### **TEXT BOOKS:**

1. "Artificial Intelligence", Elaine Rich, Kevin Knight, Tata McGraw Hill, II Edition.
2. "Artificial Intelligence: A Modern Approach," Stuart Russell, Peter Norvig, Third Edition, Prentice Hall of India, New Delhi, 2010.
3. "Prolog: Programming for Artificial Intelligence", I. Bratko, Addison – Wesley Educational Publishers Inc., Fourth edition 2011.

#### **REFERENCES:**

1. "Machine Learning for Beginners 2019", [Matt Henderson](#), [This Is Charlotte, 2019](#)
2. "Introduction to Artificial Intelligence and Expert Systems", Dan W. Patterson, [Pearson, 2015](#)

**INTERNAL ELECTIVE**

**PAPER - 3**

**B. SYSTEM SOFTWARE**

**Objectives:**

To have an understanding the basic design of assemblers, loaders, linkers, macro processor.

**UNIT I: INTRODUCTION TO SYSTEM SOFTWARE**

**Objective:** To understand the basic concepts of system software

System software vs. Application software – Different types of system software – SIC& SIC/XE Architecture – traditional (CISC) machines – RISC machines.

**UNIT II: ASSEMBLERS**

**Objective:** Ability to trace the path of a source code to object code and to executable file.

Basic assembler functions– Machine dependent and independent assembler features– Assembler design options–One pass assemblers–Multi pass assemblers– MASM assembler.

**UNIT III: LOADERS AND LINKERS**

**Objective:** To design and implementation of loaders and linkers

Basic loader functions–Simple bootstrap loaders – Machine dependent and independent loader features–Linkage editors– Dynamic linking.

**UNIT IV: MACRO PROCESSOR**

**Objective:** To understand the concepts of macro processor

Basic macro processor functions–Machine dependent and independent macro processor features–Macro processor design options.

**UNIT V: COMPILERS**

**Objective:** Ability to analyze the functions of compilers

Basic compiler functions–Machine dependent compiler features–Machine independent compiler features–Compiler design options the YACC compiler– Compiler.

### **TEXT BOOKS:**

1. "System Software–An introduction to system programming", Leland L. Beck & D. Manjula, Pearson Education, 3rd edition, 2007.
2. "Compilers – Principles, techniques and tools", A.V. Aho, Ravi Sethi, J.D. Ullman, 2<sup>nd</sup> Edition, Pearson Education, 2011.

### **REFERENCES:**

1. "Systems Programming and Operating Systems", D.M. Dhamdhare, Second Revised Edition, Tata McGraw Hill, 2000.
2. "Systems Programming", John J. Donovan, Tata McGraw Hill Edition, 2000.
3. "Systems Programming", Srimanta Pal, Oxford University Press, 2011.

**INTERNAL ELECTIVE  
PAPER - 3  
C. MOBILE COMPUTING**

**Objectives:**

- To understand the challenges of wireless communication and the solutions that is in use.
- To study about various types of wireless data networks, wireless protocols and wireless voice networks.
- To design and implement mobile applications.

**UNIT I: WIRELESS COMMUNICATION FUNDAMENTALS**

**Objective:** To understand basic concepts of mobile computing.

Introduction–Applications–A short History of wireless Communications–Wireless Transmission – Frequencies for Radio transmission–Signals–Antennas–Signal Propagation–Multiplexing–Modulations–Amplitude shift keying–Frequency shift keying–Phase shift keying–Spread Spectrum.

**UNIT II: MEDIUM ACCESS CONTROL AND TELECOMMUNICATION SYSTEM**

**Objective:** To learn the basics of mobile telecommunication system.

SDMA–FDMA–TDMA–Fixed TDM–Classical Aloha–CDMA–Global System for Mobile Communications –GPRS–Satellite Systems –Basics –Applications–Broadcast Systems – Digital Audio Broadcasting – Digital Video Broadcasting.

**UNIT III: WIRELESS NETWORKS**

**Objective:** To comprehend wireless LAN and cellular systems.

Infrared vs. Radio Transmission– Infrastructure Networks–Ad hoc Networks – IEEE 802.11 –System Architecture–Protocol Architecture–Bluetooth–User scenarios–Bluetooth Architecture–Introduction to Wireless ATM –Services–Location Reference Model.

**UNIT IV: MOBILE NETWORK LAYER**

**Objective:** To understand protocols at network and transport layer.

Mobile IP–Goals– Assumption–Entities and Terminology– IP Packet delivery –

Agent advertisement and discovery–Registration–Tunneling and encapsulation–Optimizations–Dynamic Host Configuration Protocol (DHCP) – Routing –DSDV–DSR – Alternative Metrics.

### **UNIT V: WIRELESS APPLICATION PROTOCOL**

**Objective:** To learn development of applications in mobile computing platform.

Introduction–Protocol Architecture–Wireless Markup Language(WML)–WML Script– Applications–Wireless Telephony Application (WTA) – Wireless Telephony Application Architecture.

### **TEXT BOOKS:**

1. “Mobile Communications”, Jochen Schiller –PHI/Pearson Education, Second Edition, 2003.
2. “ Mobile Computing”, Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal –Tata McGraw Hill Publications, Second edition, 2010.

### **REFERENCES:**

1. “Principles of Wireless Networks”, KavehPahalavan, PrasanthKrishnamoorthy, PHI/Pearson Education, 2003.
2. “Fundamentals of Mobile and Pervasive Computing”, Frank Adelstein, SandeepK.S.Gupta, Golden G.Richard III, Loren Schwiebert –Tata McGraw Hill Publications, 2005.
3. “Wireless Communications and Networks”, Williams Stallings–Pearson Education, Second Edition, 2009.

**SKILL BASED SUBJECT**  
**PAPER - 4**  
**OBJECT ORIENTED ANALYSIS AND DESIGN**

**Objectives:** The student should be made to learn the basics of OO analysis and design skills.

**UNIT I UML DIAGRAMS**

**Objective:** Learn the UML analysis and design diagrams.

Introduction to OOAD – Role of Analysis and Design in Software Development – Meaning of Object Orientation – Overview of Various OOAD Methodologies – Unified Process – UML diagrams Goals of UML – Use Case – Actors and Use Cases – Use Case Relationships – Class Diagrams– Interaction Diagrams – State Diagrams – Activity Diagrams – Package, component and Deployment Diagrams.

**UNIT II OBJECT MODEL AND DESIGN PATTERNS**

**Objective:** Apply appropriate object model and design patterns.

The Object Model – The Evolution of the Object Model – Foundations of the Object Model – Elements of the Object Model – Applying the Object Model. GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller – Design Patterns – creational – factory method – structural – Bridge – Adapter – behavioral – Strategy – observer.

**UNIT III APPLYING DESIGN PATTERNS**

**Objective:** Create object code from design Patterns

The Nature of an Object – Relationships among Objects – The Nature of a Class – Relationships among Classes – The Interplay of Classes and Objects – On Building Quality Classes and Objects –System sequence diagrams – Relationship between sequence diagrams and use cases diagrams –Notations: The Unified Modeling Language – Package Diagrams – Component Diagrams – Deployment Diagrams – Activity Diagrams – Logical architecture refinement –

UML class diagrams – UML interaction diagrams – Applying GoF design patterns.

### **UNIT IV CLASSIFICATION, CODING AND TESTING**

**Objective:** Learn to map design to code, Compare and contrast various testing techniques.

Classification: The importance of proper classification – Identifying classes and objects – Key abstractions and Mechanisms – Mapping design to code – Testing: Issues in OO Testing – Class Testing – OO Integration Testing – GUI Testing – OO System Testing.

### **UNIT V CASE STUDY**

**Objective:** At the end of the course, the student should be able to: Design and implement projects using OO concepts.

Case study – the Next Gen POS system, Inception –Use case Modeling – Relating Use cases – include, extend and generalization – Elaboration – Domain Models – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition.

### **TEXT BOOKS:**

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2005.
2. Mahesh P. Matha, "Object – Oriented Analysis and Design Using UML" , PHI Learning Private Limited, New Delhi, 2008.
3. Grady Booch Robert A. Maksimchuk Michael W. Engle Bobbi J. Young, Ph.D. Jim Conallen Kelli A. Houston "Object-Oriented Analysis and Design with Applications" Third Edition, Pearson Education, Inc.,April 2007.

**REFERENCES:** Simon Bennett, Steve Mc Robb and Ray Farmer, "Object

Oriented Systems Analysis and Design Using UML”, Fourth Edition, Mc–Graw Hill Education, 2010.

1. Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, “Design patterns: Elements of Reusable Object–Oriented Software”, Addison–Wesley, 1995.
2. Martin Fowler, “UML Distilled: A Brief Guide to the Standard Object Modeling Language”, Third edition, Addison Wesley, 2003.
3. Paul C. Jorgensen, “Software Testing:– A Craftsman’s Approach”, Third Edition, Auerbach Publications, Taylor and Francis Group, 2008.

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